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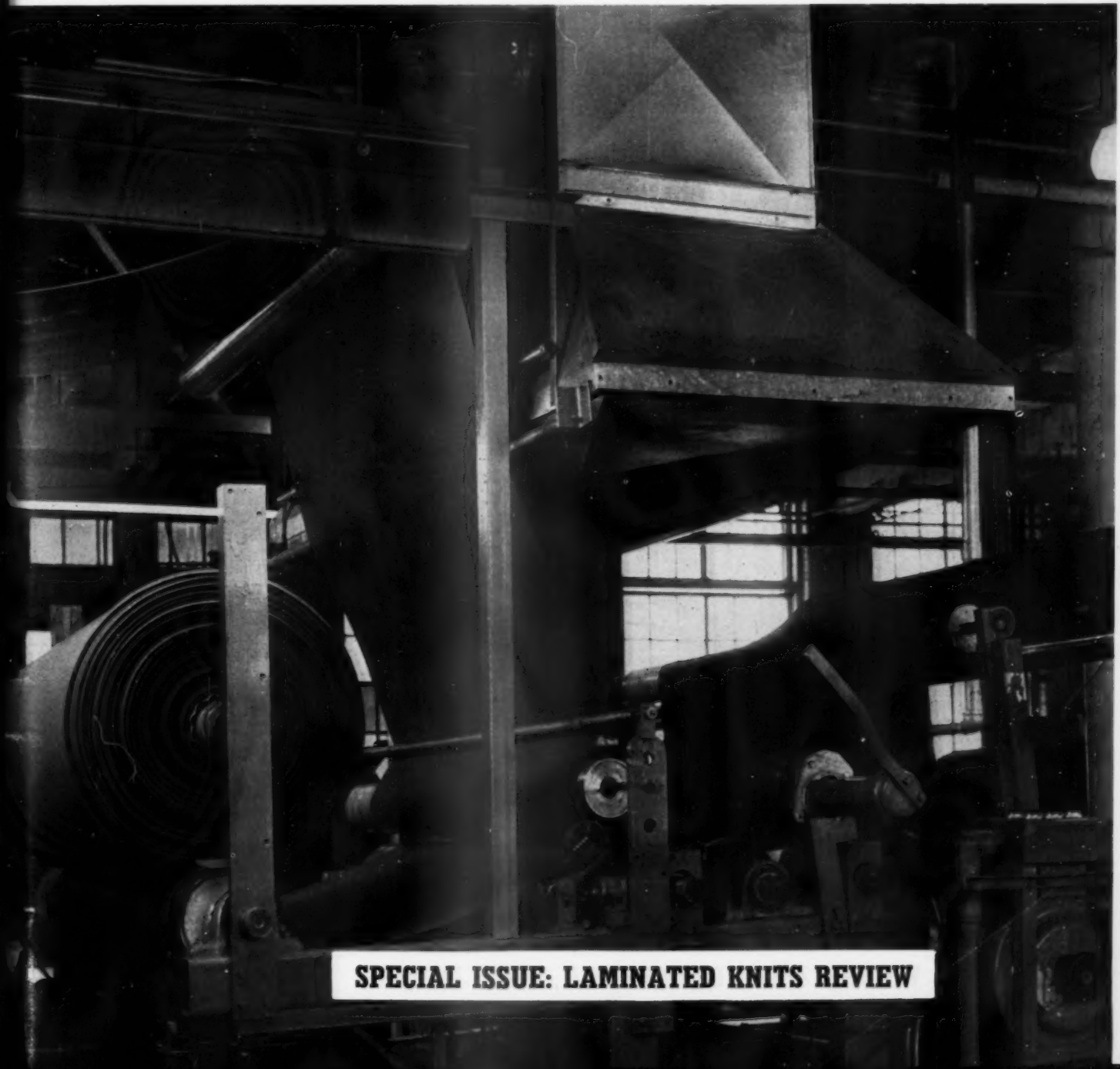

SPECIAL ISSUE: LAMINATED KNITS REVIEW

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Charles Reichman.....Editor
Irving I. Silverman...Business Mgr.

FEATURES IN THIS ISSUE

Laminated Knits Review

Laminates—A New Knitwear Dimension

By CHARLES REICHMAN, Editor

KNIT laminates have mushroomed into a business of staggering proportions in the space of a few years. Three years ago less than three million linear yards of knitted fabrics were bonded to urethane foam. Last year volume leaped to over 15 million yards and this year it is expected to soar to close to 100 million yards. By 1965, one authority predicts, unit output will reach the near-cosmic figure of 300 million yards. Not all of the volume, of course, will be in knitted foam backs—the quantity of woven fabric being bonded to polyurethane sheeting has been rising steadily—but knits unquestionably will still represent the greater proportion of the anticipated output in the next five years.

The foam-backed knitted fabric business has thrust ahead so swiftly that it is only natural that in its rapid ascent it should be subject to more than the customary convulsions attending any accelerated take-off. And to complicate things further, the field is now confronted with these two new problems:

- Intensified competition among laminators and polyurethane foam suppliers.
- Development of less costly methods of bonding knitted fabric to urethane foam.

Nobody doubts that most of the birth pangs which the industry now is undergoing will be dissipated in time; many of the difficulties that loomed large only a year ago have already been resolved. Less certain, however, is how growing intra-industry competition and newer, alternative methods of lamination—adhesive bonding in particular—will affect the industry's course in the next few years.

Growing Competition

Business in knitted foam backs is today more competitive than it was a year ago and is bound to become even more so in the next few years. Not only has the number of knitter-resources for laminated knit cloth increased tremendously in the last year but, as might be expected, there are also far more laminators and urethane foam suppliers in the business than there were a couple of years back.

When knit foam backs were first introduced on the market, the industry's needs were supplied by four laminators and probably no more than a handful of urethane foam producers.

The first laminator was the Curtiss-Wright Corp. which developed the technique of flame lamination covered by Patent No. 2,957,793. Subsequently, three other companies—Allied Polymer Corp., Precision Products Corp., a division of A. D. Gosman, and Textile Foam, Inc.—entered the field.

Firms Listed

The most important of the original polyurethane foam suppliers were Nopco Chemical Company, manufacturers of Nopco foam; Scott Paper Co., producers of Scottfoam; General Foam Corporation; and the Curon division of Curtiss-Wright, manufacturers of Curon foam. Reeves came into the picture in September, 1960, when it acquired Curtiss-Wright's rights and patents to manufacture and laminate Curon. Prior to that, Reeves had been a Curtiss-Wright licensee for laminating Curon foam.

The number of urethane foam suppliers is now considerably greater. The kingpins in this field include these four firms and a covey of smaller enterprises such as Urethane Corporation on the West Coast, Paramount Foam and Crest Foam here in the East.

In contrast to the four original laminators of foam to knitted fabrics, there are now upwards of 30 firms throughout the country that are set up to laminate circular and warp knitted yardgoods to urethane foam—and the number is swelling daily.

Surprisingly, many knitters who send fabrics out to be laminated on a commission basis fail to distinguish between the foam supplier and the laminator. Except possibly for Reeves, which produces foam under the Curon trade mark and also has extensive laminating facilities, the major suppliers of polyurethane sheeting are not set up to laminate the foam to fabric. Foam suppliers produce the material by reacting it with di-isocyanate, the basic chemical ingredient. This chemical building block for urethane foam is purchased by the foam manufacturers from other chemical producers.

In the foam manufacturing process, the di-isocyanate is reacted with either polyester glycol or polyether glycol and a catalyst. The outcome of this chemical reaction is the polymeric product called polyurethane foam. Major suppliers of di-isocyanate to foam producers are the DuPont Company which markets its product under the Hylene trade mark and the National Aniline Division of Allied Chemical Corporation which sells its product under the Nacconate trade mark. Eventually, some of the foam manufacturers will produce the basic chemical themselves. Nopco Chemical Company, for example, has announced plans to build its own plant to manufacture the toluene di-isocyanate used in the manufacture of Nopco foam.

Urethane foam is supplied in the form of thin sheets, ranging in thickness from 1/16th of an inch to ⅛ of an inch, and in lengths of up to 450 yards and widths extending from 36 to over 70 inches.

Originally, most foam was produced in one color—a dull, almost dirty-like gray. Today it can be supplied in a range of colors to complement, if not match, the basic shade of the fabric to which it is to be bonded.

Types of Laminators

Except for Reeves Bros. which, as indicated, is a prime producer of polyurethane sheeting, laminators purchase the foam used as backing for knitted fabric from manufacturers of this rubber-like, lightweight material. Laminators can be classified into two groups:

- Commission laminators.
- Vertical laminators.

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The difference between the two is that the latter are part of an integrated knit goods operation and laminate cloth basically for their own account and not primarily for other companies as commission laminators do. Where a vertical laminating company has facilities in excess of its own production requirements, the company may take on a limited amount of commission laminating business.

In method of operation, commission laminators are of two types: specialty laminators and dyers and finishers. The former entered the foam laminating field from another phase of the laminating business, usually the bonding of vinyl fabrics to textile materials. The latter, in contrast, have no previous roots in lamination but have adopted the operation as a natural supplement to their basic textile dyeing and finishing business. A recent newcomer to the field, for example, is a subsidiary of a company specializing in the piece dyeing of sweaters and the package dyeing of machine knitting yarns. An early Curon licensee also is a dyeing and finishing mill but is closely identified with the woven fabrics area rather than the knitwear field.

There is a sharp division of opinion in trade circles over the increasing competitive character of the laminated knits business. There are those, on the one side, who feel that the industry has accelerated too rapidly and that there is a clear and present danger of the field becoming overcrowded too quickly, leading to overproduction and a lowering of quality standards.

On the other hand, there are those who argue with equal force that the brisk increase in the past year in the number of commission and vertical laminators is only one more sign of the cheery prospects for laminated knits.

"The reason we have more firms in the business — more foam suppliers and more laminators—is that existing facilities are woefully inadequate," a prominent knitter-laminator stated.

Trade opinion that subscribes to the latter view is presently overwhelmingly in the majority. These resources feel that opportunities for laminated knits hardly have been tapped; that apparel is only one small aspect of this promising business; and that, in fact, the sales potential for laminated knits is far greater in other areas, especially automotive materials and upholstery and drapery fabrics, than in apparel.

"If both these markets can be developed and the opportunities for foam backs in the apparel area are expanded, there will be room for many, many more firms in the business," another major manufacturer observed.

LAMINATORS OF KNITTED YARDGOODS

COMPANY	ADDRESS	TYPE OF OPERATION
Allied Polymer Corp.	East Paterson, N. J.	Commission laminator
Ames Textile Corp.	New York City	Vertical laminator Curon licensee
American Laminators & Finishers, Inc.	Brooklyn, N. Y.	Commission laminator Curon licensee
Eddy Industries, Inc.	Garwood, N. J.	Commission laminator
Fashion Textile Laminating Corp.	New York City	Commission laminator
Kenyon Piece Dye Works, Inc.	Kenyon, R. I.	Commission laminator Curon licensee
Keystone Fabrics Laminates, Inc.	Philadelphia, Pa.	Commission laminator
Laminate Associates, Inc.	Brooklyn, N. Y.	Commission laminator
Laminated Fabrics of New Jersey, Inc. division of Originit, Inc.	Passaic, N. J.	Vertical laminator
Laminate Products, Inc.	Elizabeth, N. J.	Commission laminator
Laminate Foam Processors	New York City	Commission laminator
Nylco Products, Inc.	Clinton, Mass.	Commission laminator Curon licensee
Patex, Inc.	Wayne, N. J.	Commission laminator Curon licensee
Poly Fab	Philadelphia, Pa.	Commission laminator
Precision Products Corp. division of A. D. Gosman, Inc.	Carteret, N. J.	Commission laminator
Reeves Brothers, Inc., Curon division	New York City	Commission and vertical laminators
Rockville Processing Co.	Rockville, Conn.	Commission laminator Curon licensee
Rosemont Mills	Philadelphia, Pa.	Vertical laminator
Rosfor Mills Corp.	New York City	Commission laminator Curon licensee
Shawmut, Inc.	Stoughton, Mass.	Vertical laminator Curon licensee
Sunbury Textile Mills	New York City	Commission laminator Curon licensee
Textile Foam, Inc.	Palisades Park, N. J.	Commission laminator
U. S. Laminators	Patchogue, L. I.	Commission laminator
Wyndmoor Knitting Mills	Elizabeth, N. J.	Vertical laminator Curon licensee

Types of Lamination

The principal, if not the sole, method used up to now to bond knitted fabric to urethane foam is flame lamination, the basic technique covered in the original Curtiss-Wright patent now owned and controlled by Reeves Bros.

In flame lamination the urethane sheeting is first exposed to a butane gas flame which melts the foam, creating a tacky surface. The foam is then slightly cooled by passing it over a cold roller and fed simultaneously with the knitted fabric to which it is to be bonded, into a nip roller which forces the two materials together, creating a firm and lasting bond.

Although regarded by many in the textile industry as a rather crude method in terms of streamlined textile technology, the chief advantage of flame lamination is that the bond is permanent and resistant to delamination when the foam-backed fabric is dry cleaned and laundered.

However, flame lamination has a few drawbacks. For one thing, it is a rather costly operation. The investment in equipment is high and in effecting the bond, a substantial portion of the foam has to be burnt away. The knitter is required to pay for the original thickness of the foam and not the reduced thickness left after lamination.

A further disadvantage of flame-laminated knitted cloth is that silicone finishes cannot be applied in advance of lamination. Only after the fabric has been bonded to the foam can a

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silicone base agent be padded on; otherwise the foam would not adhere to the fabric.

It is for these reasons largely that ever since the knitted foam backs hit the market other faster and more economical means of bonding urethane foam to knitted cloth have been sought.

Adhesive Procedures

The adhesive method of lamination has been the most promising in this regard, but the main drawback of this technique is that until recently it has been impossible to achieve a durable bond with an adhesive comparable to that obtainable via flame lamination. Aside from low bond strength, knitted fabrics welded to urethane foam with a chemical cement also have exhibited a harsh hand.

The development recently of new types of adhesives specially designed for bonding knitted fabrics to urethane foam has prompted many knitters as well as laminators to take a closer look at this method vis-a-vis flame lamination. These new adhesives are claimed to overcome the disadvantages of the earlier textile cements that had proved impractical. A merit of the newer adhesives is that they can be readily applied. In comparison to flame lamination, they also possess these other significant advantages:

• No loss in urethane foam thickness. Under the adhesive method a manufacturer requiring a 1/16ths of an inch foam backing need pay only for such foam. Under the flame lamination treatment to achieve a 1/16th of an inch foam backing the laminator must start with a 3/32nds of an inch thickness of foam.

• No investment in expensive heat laminating equipment is required. Cost of lamination is reduced and the operation itself speeded up.

Adhesives claimed to be suitable for use on urethane foam are of two basic types: (1) Those which require moderate curing at elevated temperatures to activate the adhesion process and (2) those which dry by mere exposure to the atmosphere. Naturally, drying of adhesives under ambient condition, can be speeded up by subjecting the bonded material to a heat treatment.

ADHESIVES FOR LAMINATING KNITS

• ALCO ADHESIVE COMPOUNDS—Manufactured by Alco Oil & Chemical Corp., Philadelphia, Pa.

• ATLAS ADHESIVE ADH-100—Product of Atlas Coating Corp., Long Island City, N. Y.

• CUSTOM BOND — Product of Custom Chemicals Co., Inc., East Rutherford, N. J.

• MANIFLEX 789—Produced by Manufacturers Chemical Co., Inc., Camden, N. J.

• UNITHANE ADHESIVE 200 —Marketed by Thiokol Chemical Corp., Trenton, N. J.

• VERONA COMPOUNDS — Distributed by Verona Dyestuffs, Union, N. J.

All of the adhesives may be applied by roller, spray, knife or rotogravure techniques. Some are described as one-package adhesives; others are two-package systems, requiring a catalyst or otner additive to activate the bonding process.

The adhesive method of laminating knitted fabric to urethane foam is still too new to determine what its impact will be on flame lamination. If the newer adhesives that have recently been introduced prove in end-use to perform as well as the companies producing them claim, then there is no question that this technique will gain at the expense of heat lamination. The cost factor alone makes the adhesive method more desirable, providing no large scale investment in adhesive application equipment is required. However, still to be answered are these questions:

1. Is the bond strength of a knitted fabric laminated to foam via an adhesive as durable as that of a knit cloth bonded to foam through flame lamination?
2. Will the adhesive-bonded fabric withstand dry cleaning solvents?
3. How resistant will the adhesive-based knit laminate be to rigorous home laundering?
4. What effect will the adhesive have upon the hand of the fabric?
5. Will the adhesive discolor the fabric?
6. Do certain types of synthetic fibers such as nylon present special problems with adhesives? Can these difficulties be easily surmounted?

Most knitters, despite their keen interest in the adhesive method, are awaiting the trade's answers to these questions before shifting from flame lamination. The fact that in England, the adhesive method has been widely accepted is viewed as an interesting but not necessarily conclusive development.

Processing Problems

Most of the headaches plaguing the laminated knits field stem largely from its lightening growth and the inability of laminators to handle the staggering volume of business that suddenly cascaded on them. In their anxiety not to turn any customers away and their determination to do a creditable job rapidly, a few of the early laminators in the business apparently took on far more work than they could normally process. Add to this the fact that the technology of flame laminating urethane foam to knitted fabric had not been fully developed and the reason for many of the problems facing the trade quickly become evident.

Among the difficulties that have proved particularly perplexing and to the solution of which responsible laminators are devoting their major attention are the following:

EXCESSIVE FOAM BURN-OFF —Burn-off is the difference between the starting thickness and the finished thickness of the foam after it has gone through flame lamination; in other words, it's the amount of foam that has be burned away to assure a good bond. Most knitted fabrics are laminated to urethane foam measuring from 1/16th to 3/32nds of an inch in thickness. However, laminators have to start with, and knitters, of course, are required to pay for, foam of greater thickness—3/32nds to ⅛ of an inch thickness. In sandwich lamination—the process of bonding knitted fabric to both sides of the foam—a foam of even greater thickness may be required. In principle, the thickness of foam burned away should measure about 1/16ths of an inch. But the process of flame lamination is not that precise that the correct amount of foam will always be burned away. Moreover, the nip roller operation that follows exposure of the foam to the flame may serve to compress the foam to an extent that the thickness may be still further reduced. Frequently, therefore, the knitted laminated fabric may actually end up with a foam thickness somewhat less than the 1/16th of an inch for which the knitter contracted.

UNEVEN BURN-OFF — An outgrowth of the problem of excessive burn-off is lack of uniformity in the amount of foam removed in the burn-off process. Here too, in theory, this can be controlled but if the levelness or temperature of the flame to which the foam is subjected varies, this can result in uneven burn-off or so-called thick and thin places on the foam. This sort of thick and thin foam should not be confused with the variations in foam thickness and fineness sometimes found in unlaminated foam. The latter is the responsibility of the foam manufacturer and is caused by improper foam manufacture. Thick and thin foam resulting from uneven burn-off is the responsibility of the laminator. Fortunately, the problem of uneven burn-off does not arise too frequently. Knitters getting into the laminate field for the first time should, nevertheless, be on guard against this difficulty.

UNDUE FABRIC SHRINKAGE—This is a problem, the cause of which may be difficult to pin down. In most instances, the responsibility for it rests with the knitter; in a few cases the laminator. Excessive fabric shrinkage occurs when, on the one hand, a knitter delivers cloth to the laminator stretched beyond its normal width and/or improperly calendered and finished; on the other hand, when the foam is fed to the flame laminating machine at improper tension. In either case, the outcome is a fabric with a shrunken, puckered surface.

EDGE TRIM WASTE—To assure that laminated cloth will lay up properly on the cutting table, it is essential that both edges of the bonded material be trimmed. This step is necessary

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too if neat, cleanly cut fabric selvedges are to be produced. If a length of laminated knit cloth is improperly trimmed, as much as an inch of fabric will be lost. This further reduces the yield of the fabric as compared to its width when first delivered by the knitter to the laminator.

Many knitters are not aware of the importance and necessity of the edge trimming operation; their ignorance on this score has been at the root of most complaints over excessive edge trim. Some laminators, however, will admit that on occasion the amount of fabric trimmed has been excessive and may be a means of covering up a processing error. Generally, excessive edge trim will occur when a fabric exhibits pronounced edge curl.

To overcome edge curl, laminators usually gum the sides of the fabric to assure that in processing the fabric will remain flat. Usually laminators endeavor to restrict the gumming to no more than one-half inch on either side of the fabric. But where the edge curl problem is pronounced the gum has to be applied over a wider area of the fabric. After lamination the gummed edges are trimmed off. Naturally, where gumming extends over more than one-half inch on both sides of the fabric, the laminator is unable to deliver cloth at the prescribed finished width.

SEE-THROUGH—The problem of see-through—the foam backing showing through to the face of the knitted fabric—is not as prevalent a difficulty as it was originally. See-through problems still crop up due chiefly to the application of foam to fabrics with an especially open stitch structure or to knit cloth of sleazy construction; that is, cloth having fewer courses and wales per inch than the particular knit construction would require.

BOND STRENGTH — The measure of the amount of force necessary to delaminate a piece of fabric from its foam backing is known as bond strength. In judging bond strength it is necessary to consider the stage at which this property is measured or judged. Many fabrics will hold up in normal wear but will come apart after laundering or dry cleaning. Others may hold up after being subject to vigorous washing or the solvent action in dry cleaning but will delaminate after wear. Moreover, bond strength is also affected by the finish applied to the yarn prior to knitting or to the fabric after knitting. Silicones used to impart softness, water repellancy or to ease sewing, if applied prior to lamination will affect the strength of the bond. So too will spinning oils. Frequently, if not washed out these will tend to block lamination.

Though no clear-cut solutions to all of the processing problems listed above are at hand, most trade observers are rapidly coming around to the belief that the best way of tackling them is by the following steps:

- Setting up quality standards with regard to the foam used in the backing as well as the quality of the bond.
- Advance testing by laminators of all fabrics to spot any possible processing difficulties.

On this latter point, it is felt that particular consideration must be accorded these points:

1. What is the condition of the fabric? Is it too stretchy or will it be distorted in the application to foam.

2. Is the fabric too open? Are the interstices of the loop structure such that there will be considerable see-through?

3. What sort of treatment did the fabric receive prior to being sent to the laminator? Is it dimentionally stable? How has this been accomplished — through conventional finishing procedures (calendering, etc.) or through application of resins, as in the case of cotton?

4. Has the fabric been properly scoured and dyed? Are there any oils in the fabric that will prevent a firm bond? Will the dyestuffs or other finishes used, such as silicones, affect the hand?

5. What sort of performance will the fabric have to undergo in end-use. Is it supposed to be launderable? Will it be dry cleaned? If of wool will the wool felt or has the wool been treated to resist felting shrinkage? Will the shrinkage control chemical employed affect the bond?

6. If the laminated knit cloth is supposed to be washable, is the dye used fast to washing?

Laminated Knits Review

Fabrics-To-Foam Materials: A Fast Growing Field

By HERBERT S. HOWARD
President, Amerethane Industries, Inc.

URETHANE foam laminates this spring have gone through their first season. Prior to this spring, knit foam laminates had been on the scene in volume only two previous seasons—both fall-winter markets. In spite of being a new material, it has made a deep penetration of the knitwear market where knit laminates have been directly instrumental in the broad adoption of knits in many product areas, not previously possible. Men's and women's jersey knit rainwear, nylon tricot laminates for jackets, active sportswear and related styles could not have existed except for foam lamination.

Cotton bulkies, performing as well as wool; Orlon and Dacron knits achieving dimensional stability; and light gauge fabrics with body and hand, have all been a challenge to the designer's ingenuity, making possible new styles and concepts unheard of before.

All these new and exciting developments in the apparel field, and particularly in the knit fabrics markets, have been further supplemented by mills and converters finding completely new markets for their products. The automotive fabrics field, furniture textiles, pocketbook and handbag trades, and the shoe and slipper field have appeared on this new horizon as a challenge to the areas that were formerly exclusive fields of the weaving loom.

Knitters, knit converters and their sales and design departments should take a new look at their potential with an eye to fabric design and color that will have special appeal to these new markets. Foam laminates now make your products acceptable and feasible for these fields, and are limited only by design concepts and marketing efforts.

Here is an opportunity to diversify markets, and level off the peaks and valley in sales that are so frequently responsible for poor delivery, uneconomical unloading of over-produced merchandise, and poor production scheduling and personnel headaches. Market diversification with the same overhead and machine investment is a rare opportunity that can be exploited by proper analysis of style potentials and exploration of these new markets.

Textiles laminated to urethane foam have enjoyed this fabulous advance in spite of production problems caused by a too rapid growth in a new technology. Laminators have too frequently been unfamiliar with textile practices and textile handling requirements. Broad knowledge is needed to understand the limitations and special handling needs of every type of fiber from synthetics to natural fibers in all varieties of construction, from light gauge tricots to heavy bulky knits. These have all compounded the laminators' need to gain an education and train his crews in the many variations encountered.

Additional problems are the many types of finishing chemicals used to impart hand, crease and shrink resistance. Resins frequently cause laminating problems such as delamination, poor bond, difficulty in removing center creases from circular knits, and ripple effects in fabrics having excessive shrinkage after washing. The rapidly expanding use of urethane foam laminates has made it of vital importance that research and test programs in the field of textile chemicals compliment the needs of the industry. Such leading companies in this field,

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Laminated Knits Review

Nylco Products Builds Equipment For Flame Lamination

By EDWIN K. LANGILLE

CLINTON, Mass. — Nylco Products, Inc., a growing firm which laminates polyurethane foam to fabrics on a commission basis and also manufactures the machinery for the process, is one of the two companies in the country which produces automatic equipment for laminating fabrics. The company, according to William T. Snyder, president, operates on a national scale dealing directly with manufacturers only for commission assignments and manufacturing equipment for licensees of Reeves Brothers, Inc., holders of the basic flame lamination patents. However, Mr. Snyder said that 95 per cent of the present volume of both construction and commission business, originates along the eastern seaboard from New Jersey to New Hampshire.

Nylco is now producing laminating plants for Shawmut, Inc. and Ames Textile Corporation, recently licensed by Reeves Brothers as laminators for its Curon foam. Mr. Snyder said that automatic laminating equipment with automatic machines for splitting, tenting, winding and re-winding could probably be set up at a cost of around $50,000, including the actual laminating mechanism, valued around $18,000.

Any fiber, natural or synthetic, and any fabric from jersey to bulkies—even brushed materials—can be and have been successfully laminated at Nylco. Roller pressure at the point of lamination is negligible for close knits but naturally the pressure may be from ten to twenty times greater for plushy or bulky materials where the cushion is greater. See-through has been practically eliminated by the over-all even and adjustable tension on the tentering frames but this is particularly guarded against on bulkies where the knits are open and loose.

The volume of yardage now processed at Nylco runs predominately to blends of 80 per cent Orlon and 20 per cent wool and to worsted jersey knits. Mr. Snyder said that currently there appears to be a trend toward all-worsted fabrics.

From mid-June to October, the Clinton plant processes around 100,000 yards per week on commission at a cost of from 20 to 22 cents per linear yard regardless of width and exclusive of the cost of foam, a highly variable factor at this time. Knits are received from manufacturers in five to 10,000 yard lots, widths generally ranging from 42 to 72 inches. It requires about fourteen men to handle 10,000 yards a day and this includes splitting, tentering, winding, trim processing and packaging.

Knit yardage for processing comes from the mills in tubular or flat form. Full-fashioned material cannot be laminated as yet. Circular knits should not be calendared as one of the problems of the laminator is to remove the crease. If a hard crease is set, the problem is that much more difficult.

Nylco maintains a stock of about 100,000 yards of foam from 3/32 to 1/16 of an inch thick in beige and charcoal shades. The material is available in tints such as greens and pinks but in general this form of plastic is not particularly color-fast. Slabs come in from the producers in rolls of about 800 yards and are built up on automatic winders to jumbo rolls of around 2,000 yards for continuous production.

When orders are received, five copies of the specifications are made, one for the splitting processor, one for the laminating department, a third to quality control and a fourth for the trimmers with the original for office handling. Notice is sent to the knitting mills upon the receipt of material for processing.

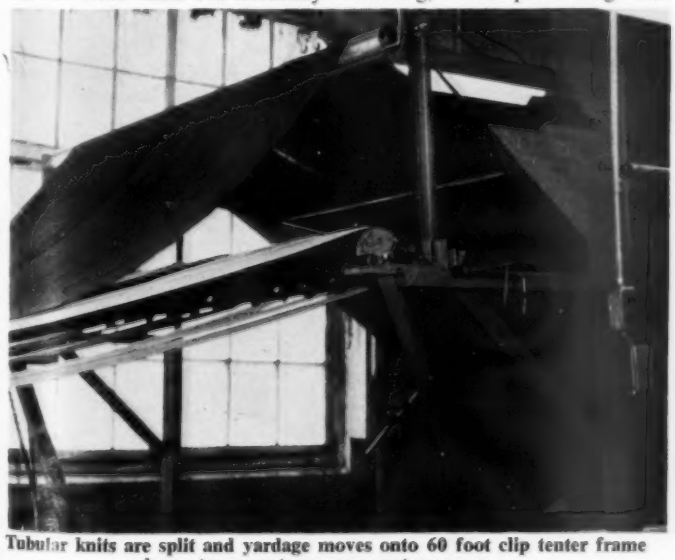
For tubular knits, Nylco uses a splitting device of its own creation which is a part of a 60 foot clip tenter frame. Clips, set on a chain belt on either side of the belt conveyor, automatically grip and stretch the yardage as it passes over a steam blower and hot air dryer and moves along with it in a continuous action, releasing the material at the end of the belt as it winds into rolls. The clip tenter frame now in use at Nylco has two steamers but one is usually sufficient and accomplishes the process at a rate of from 50 to 200 feet per minute. Yardage with the center crease removed is rolled on square aluminum shafts easily transported to the lamination department on the floor below.

The winding, laminating and trimming equipment are all push button controlled. The foam is wound into jumbo rolls of 2,000 yards immediately adjacent to the laminator so rolls are shifted from one mounting to the next and the operation is practically continuous.

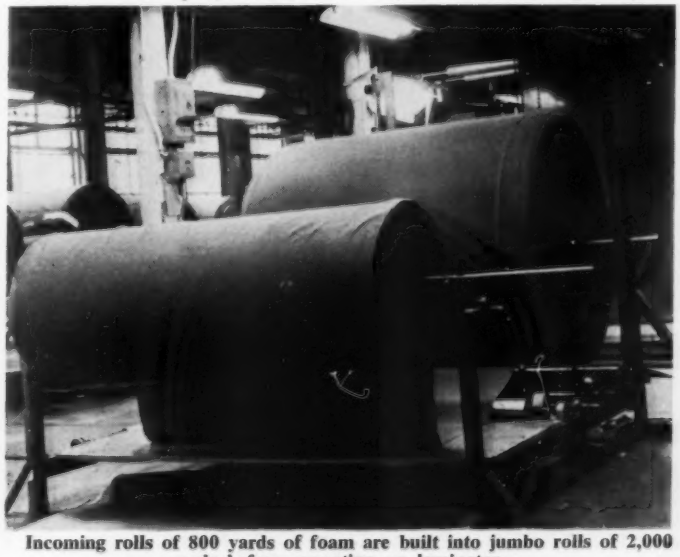
For knits that come in narrow and when it is desirable to stretch its full width, the fabric is conducted through an automatic pin frame as it enters the laminator. This is simply a continuous chain of pins set about a half inch apart with two revolving brushes on either side to prevent crimping. The frame is adjustable to accommodate widths from 42 inches to six feet.

Heat up to 450 degrees F. is applied to the foam by a series

(*Continued on Page* 13)

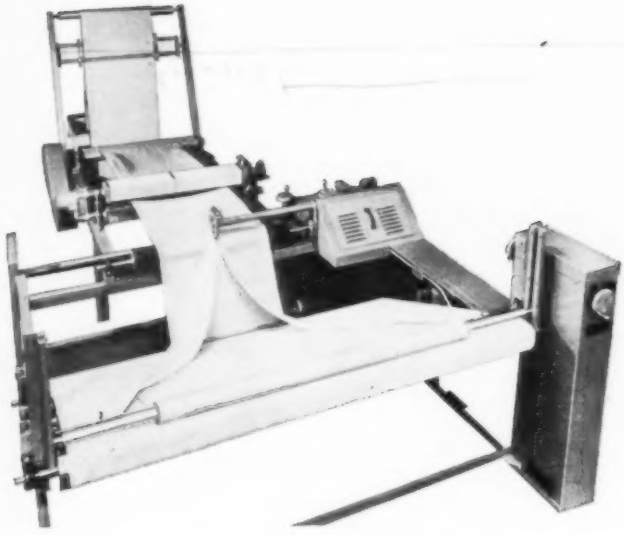


Tubular knits are split and yardage moves onto 60 foot clip tenter frame where steam vents remove center crease.



Incoming rolls of 800 yards of foam are built into jumbo rolls of 2,000 yards before mounting on laminator.

look to



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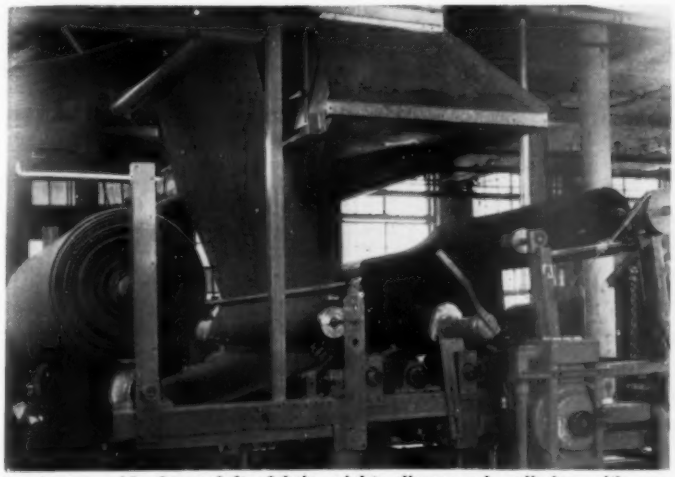
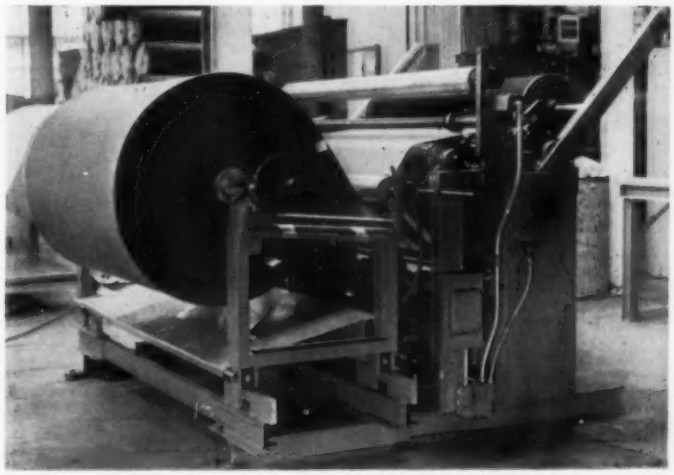


Laminator with foam left, fabric, right, disengaged cylinder with gas burners, center. After heated to 450° F., foam passes over water-cooled cylinders before contact is made with fabric.



Trimmer automatically reduces jumbo rolls of laminated knits to rolls convenient for handling and is equipped with guidance and metering mechanisms.

of gas burners extending the width of the slab and mounted in a cylinder which may be disengaged by hand-lever. The foam brought to a tacky state, immediately passes over water-cooled cylinders and is brought into contact with the fabric. Relatively slight roller tension is required to make the bond. Gases created in the process are drawn off by overhead vents.

Jumbo rollers of laminated foam and fabric are run off into convenient lengths, usually about 100 yard lots, for packaging. This is also an automatic operation during the trimming process and the machines are equipped with a Nylco patented guidance system, customarily set for widths of 52, 54, 58 or 60 inches, and also automatic measuring meters. Rolls of laminated stock for return to knitting mills are packaged with a double wrap of 70 pound kraft paper.

Licensing agreements stipulate stringent quality control requirements and for testing, Nylco maintains a laboratory with apparatus for insuring the tensile strength of the bond per square inch and the retention of uniform thickness.

The firm is a family organization with William T. Snyder, president, doing the designing and engineering, and his son, Thomas R. Snyder, vice president in charge of sales. A third member of the family, E. A. Snyder, is the treasurer. The company started in Irvington, N. J., in 1938 after William Snyder developed an interest in the field more or less by accident.

"I owned a fleet of fishing boats operating off the New Jersey coast," Mr. Snyder recalls. "I do not have a formal engineering education but have always had a flare for machinery, and a friend of mine called me in to see if I could fix a German laminating machine he wanted to use in box making. I finally got the thing to work with some innovations of my own design and saw a market for improved equipment."

Nylco machines were first designed for paper and plastic laminations, and the firm undertook such specialized assignments as processing motion picture projection screens and photographic materials. The move to Clinton was made in 1941 where the company now occupies 75,000 square feet in a building formerly a part of the Bigelow - Sanford Carpet Company. An area of 35,000 square feet, spread over three floors, is used for custom lamination while the additional space, located in a one-story plant, is used for machinery to fabricate parts and for the assembly of equipment sold to other laminators. In the near future, Mr. Snyder anticipates the construction of new automatic equipment for the Reeves Brothers, Inc. Sixty-five workers are now employed at the Clinton plant.

Mr. Snyder said that a new adhesive process has just been completed for which patents are pending and that in a few weeks the company will announce a new, better and faster method of laminating that will save from 10 to 15 cents per yard.

Knit Foam - Backs Fast-Growing Field

(*Continued from Page 9*)

as American Cyanamid, Sun Chemical, Du Pont, Cravanette and Dow-Corning are currently attacking these problems. Improved water repellancies and finishes that will aid rather than disturb bond security are being studied. These studies, plus the better understanding of the fabric limitations—and the development of fabrics and fibers specifically suitable for lamination —are special projects being studied by the fiber producers and knitting and weaving mills.

The natural trend of the vertical mill, adding laminating for their dyeing and finishing facilities is toward progressive contract dyeing and finishing companies supplementing their operations with laminating set-ups. This trend enables the smaller mills and fabric converters to keep pace with the vertical mill in the marketing of laminates. This trend cannot help but improve the produce on several major fronts. It will mean more technical knowledge in dealing with chemical finishes and fabric handling, better understanding of the acceptable textile practices in production scheduling and fabric packaging. In addition, it will provide controls and mature responsibility in the maintenance and adoption of inspection and quality control procedures. Finally, it will make for greater economies in the vertical finishing of fabrics, where the same plant will be able to process grey goods through dyeing, brushing, napping, sueding, shearing, water repellancy and laminating, without reshipping and eliminating the long periods involved in rescheduling goods to several plants.

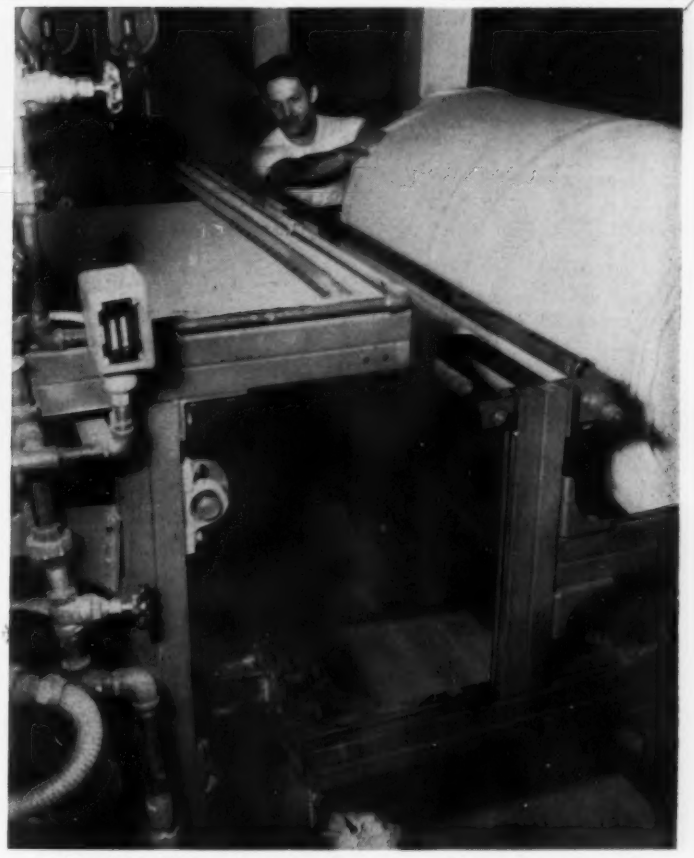
Technical responsibility for all related functions can also be more easily pin pointed than would be the case when several companies are involved with the varied functions on the same fabric. It will mean that only the experienced and financially responsible plant, sufficiently capitalized, with well-trained personnel and equipment for extensive fabric processing, will be able to remain competitive in this field.

Developing lamination techniques and methods also point to the strong advance of adhesive processes competing with the heat fusion method. Several of the major rubber companies are also taking a good hard look at the urethane textile field with an eye to entering the market at the foam producing level. This will mean improved foams and greater research efforts at the raw material level. All these things add up to a rapidly growing extension of the textile foam laminating market with great new strides and developments on the expanding horizon, with all the opportunities that this can present to the alert, market-conscious and growth-interested knit mill and converter. It will mean, however, keeping awake to a new technology and all its varied facets from foam to textile chemicals, and from new fibers to new fabric constructions.

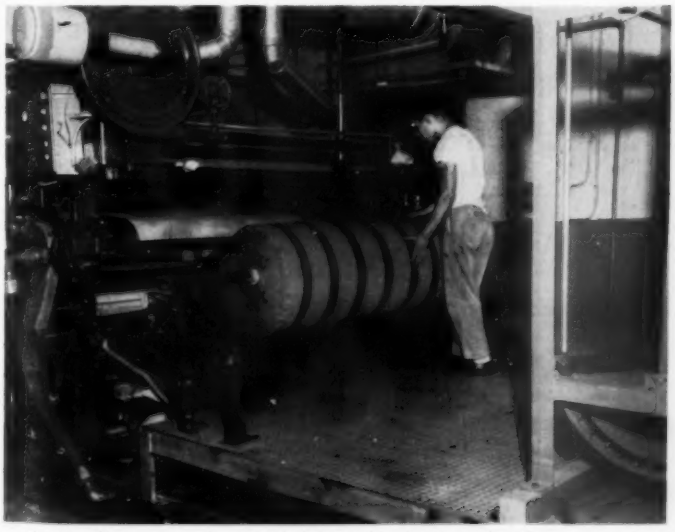
Laminated Knits Review

How Reeves Bros. Laminates Knit Cloth To Curon Foam

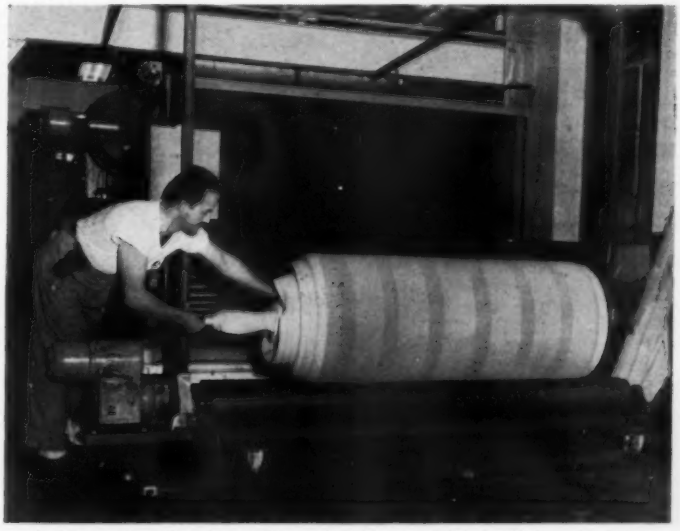
1. Preparing tubular goods for lamination. Tubular piece goods are slit with horizontal knives, steamed and rolled preparatory to lamination. Operation is done on a multi-stop basis on Tube-Tex steamer, framer and cloth slitter.



2. Feeding Curon into lamination machine. Curon urethane foam being fed into one end of the Reeves laminator. Foam will be heated by direct flame and when soft and tacky will be compressed to a second material to form the finished laminate.



3. Feeding second material into laminator. At the same time foam is being fed into the Reeves laminator at one end of the machine, material being laminated is fed from the other end.



4. Removing laminate from laminator. This roll has just been laminated to Curon foam. Before it is shipped to Reeves' customer it will be trimmed of excess foam and inspected for quality.

Laminated Knits Review

Rigid Controls Help Nopco Maintain Foam Quality

By RICHARD SINGER,
Manager, Flexible Urethane Foam Sales
Nopco Chemical Company

COMPREHENSIVE specifications, rigid quality control and a superior product in its new Nopcofoam Insulining have helped make Nopco Chemical Company the world's largest producer of apparel foams for garment interlinings. These extensive specifications, with accompanying rigid control of quality, have been established in a program which affords control of foam thickness, cell size, density, striation, holes and general appearance. The program is in effect continuously from production of the basic raw foam through to packaging and shipment of the finished peeled goods.

At the firm's Plastics Division headquarters, North Arlington, N. J., for instance, foam samples are taken from the producing line every 15 minutes. They are sent to the physical testing laboratory for immediate, comprehensive testing. The results, obtained within 10 minutes, can signal a change in ingredients or the halting of the producing line in accordance with the results of test.

Early in 1961 Nopco introduced its special new formulation of polyester foam—Nopcofoam Insulining—for laminated apparel. It has already proven a giant step forward in meeting the textile industry's requirements for a foam superior to any previously available.

And this new foam has opened up entirely new areas for knitted goods, with the possibility of using fabric from any knitting machine as the outer shell. Prior to the advent of foam, most knitted fabrics were restricted in variety of uses because of their inherent tendency to stretch and sag. Foam gave the necessary stabilization and the additional quality of warmth with extremely light weight for outerwear.

It also supplied such other features as good shape, drape and hand, and crease and wrinkle resistance. It has permitted lighter weight goods to replace heavier goods and similar feats of fabric upgrading.

Its ability to be dry-cleaned, resistance to soaps and normal breathing—fabric pores are not blocked and natural tendency of foam to breathe is not impaired —are other important characteristics.

Additional features include strength, resistance to tearing, non-aging, ability to dry quickly and not retain odor, and resistance to bacteria, mildew and fungus. The foam also will not shed or shred, flake or crumble.

Ability to deliver in large volume has put Nopco in position as supplier to many of the largest and finest finishing houses, textile mills and laminators in the country. And its ability will increase as the year 1961 progresses, through completion of five major facilities expansions centered primarily on foam production and fabrication for garment interlinings. These expansions include:

- A third major increase in production facilities at division headquarters operations.
- A new foaming and fabricating plant at Chattanooga, Tenn.
- A similar new facility in the Midwest.
- Acquisition of six foam companies in the Midwest.
- Addition of major new plant space for foam fabricating.

These expansions have been planned to help Nopco meet the continuing surge in demand for its foam in an industry-wide expansion to gear up for an anticipated demand for 300 million yards for knit goods alone, according to research and trend studies.

Nopco was one of the first companies to experiment with and produce foam for garment interlinings in the middle 1950's. Since that time the demand for foams has necessitated a series of substantial expansions, and the company is now equipped to supply 60 per cent of this year's entire textile industry requirements for the laminating foam.

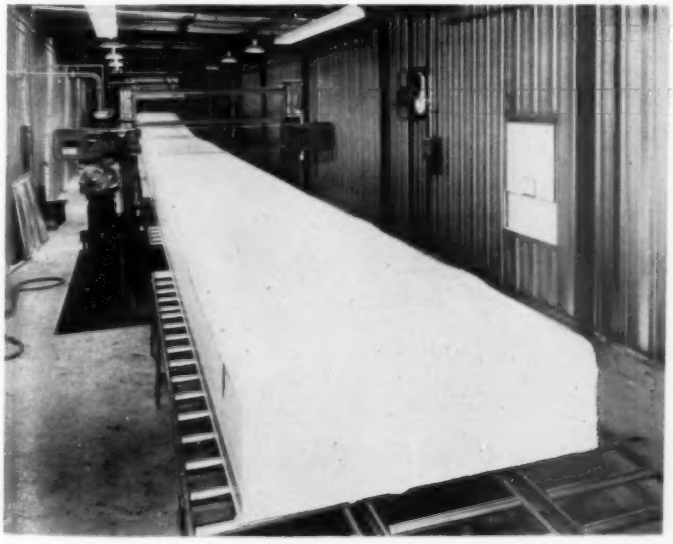
First was a new plant for the Plastics Division, followed by several expansions of the existing facility. On June 14 a new Chattanooga, Tenn., foaming and fabricating plant was formally opened to produce and fabricate flexible foams primarily for the textile, furniture, bedding and quilting, aircraft, boating and automotive industries.

Another recent expansion move has been the acquisition of substantial new production area at Kearney, N. J., at the former Congoleum-Nairn plant, solely for large-volume production of peeled goods for garments.

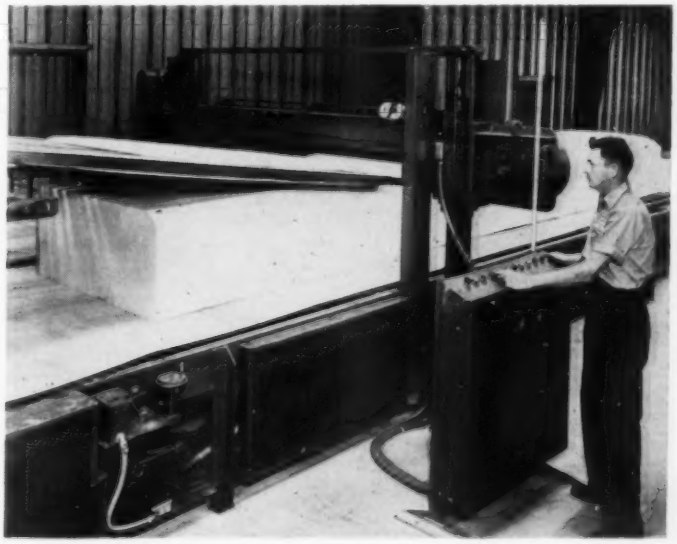
Later this year a new Midwest foaming and fabricating facility will be placed in operation, similar to that at Chattanooga, and construction will be completed on the firm's multi-million dollar toluene di - isocyanate plant at Linden, N. J.

This plant will go on-stream early in 1962 to produce the basic foam ingredient, and it will put Nopco in the position of being the most integrated as well

(*Continued on Page* 33)



Foam line turns out a continuous slab of material similar in appearance to loaf of bread. Here, cured foam is cut into long buns by a special traveling cut-off saw.



Fabricating can be arranged to provide foam blocks, slab or sheets of virtually any dimensions. Here, operator in the splitting and packaging department is topping a foam bun.

Laminated Knits

Polydynamic Bakes And Cures Laminates To Hold Finish

By ALAN SIEGLER

FAIR LAWN, N. J.—A problem in laminating foam to fabrics has been how to waterproof the fabric with a silicone finish. The repellent makes the bond unstable. Polydynamic Corp., a new firm, near Paterson, N. J., contends that it has the problem licked. Its solution is a two-section finishing machine through which the laminated and treated fabric is run for drying and curing to hold the bond steady and to fix the water repellent and other finishes so that they will bear up under launderings — not just one, but six or seven.

The first section is an enclosed tenter frame about a hundred feet long. At one end, the water repellent—usually Sylmer, a Dow-Corning product—and other chemicals are mixed in a vat and applied to the laminated fabric.

It is then run through the dryer at carefully regulated speeds and temperature. According to Bruce Jackson, who who is in charge of foam processing, there is no magic formula that tells the operators how fast to run the fabric and how hot the box must be. "It's more art than science," he says. It is experience, including some mishaps, that enables Mr. Jackson and his crew to decide the optimum combination for drying and curing.

Each job lot presents its own problems. The machinery is designed for maximum control, eliminating much of the variation and capricious behavior of textile machinery.

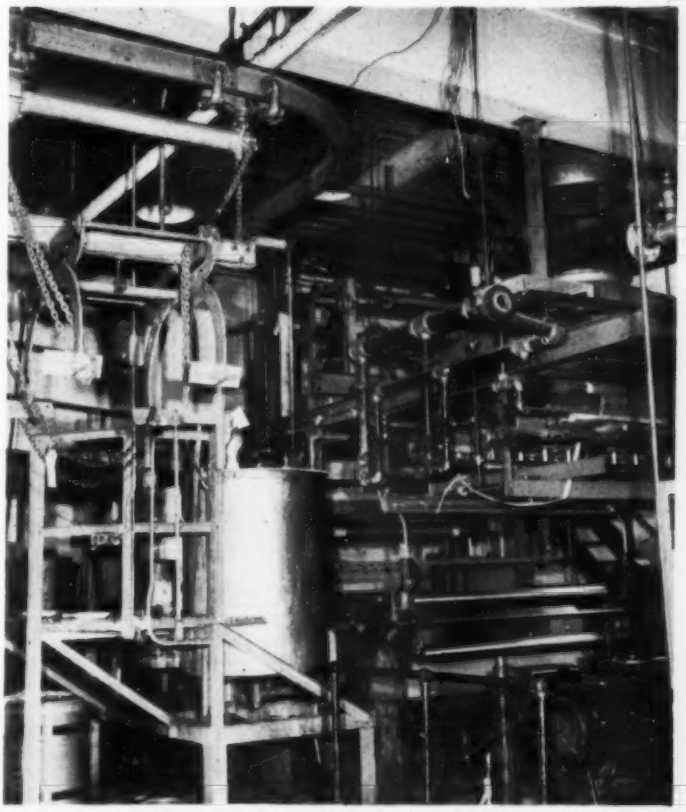
The fabric can be run at speeds as high as 100 feet per minute, though it is seldom done. At 80 feet per minute and up, control is very difficult, if not impossible. The temperature can range as high as 600 degrees F. The right temperature is an important ingredient of success because application of heat to fabrics laminated with heat loosens the bond.

All along the route of the tenter frame there are controls and electric eyes. At each end of the box, operators keep the work under scrutiny and transmit their observations and instructions over an intercom.

An inspector checks the fabric as it emerges, with the aid of gauges.

From the drying box, the

(*Continued on Page* 65)



At Polydynamic Corp., Fair Lawn, N. J., laminated fabrics are treated with finishes before moving into the finishing range for drying and curing. The chemicals—notably Sylmer, Dow Corning's silicone water repellent—are mixed in the vat and applied to the roll of fabric.

The tenter frame, first section of the finishing range, is about 100 feet long. The fabric can be run through at speeds as high as 100 feet per minute and at temperatures up to 600 degrees F. Control of the temperature and the speed is essential to securing the finish on the fabric. The next step is curing.

All goods must pass rigorous inspection. The firm guarantees its work. The plant was acquired by Polydynamic from a finisher of woven goods and the machinery adapted to knit goods finishing. The firm is an independent, under the same ownership as Allied Polymer, a laminator.

Motivational Research

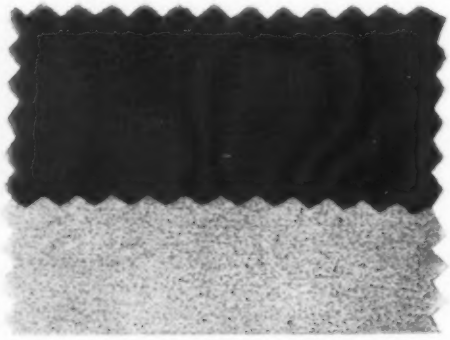
might have written these specifications

M/R

Unfulfilled Consumer Need:

Consumers are looking for warm lightweight outerwear which is also water repellent. They want it warm enough for chilly weather but light enough to wear when the sun comes out. In short, they want all-purpose garments which will keep off the rain and will be comfortable in all kinds of weather. Great potential here!

The answer to this unfulfilled consumer need is Lamination



Lightweight knitted or woven fabrics, laminated to airy polyurethane foam

NORANE® treated fabric by GRACE

The hidden ingredient in this successful lamination formula is the water repellent finish with which the fabric is treated. The finish must be just right. It must provide effective water repellency and spot resistance while retaining the quality of the fabric and without affecting the permanent bond of lamination between the fabric and the foam backing.

NORANE® ACHIEVES THIS SUPERBLY

The Norane® finish provides water repellency, spot & stain resistance, plus best sewability

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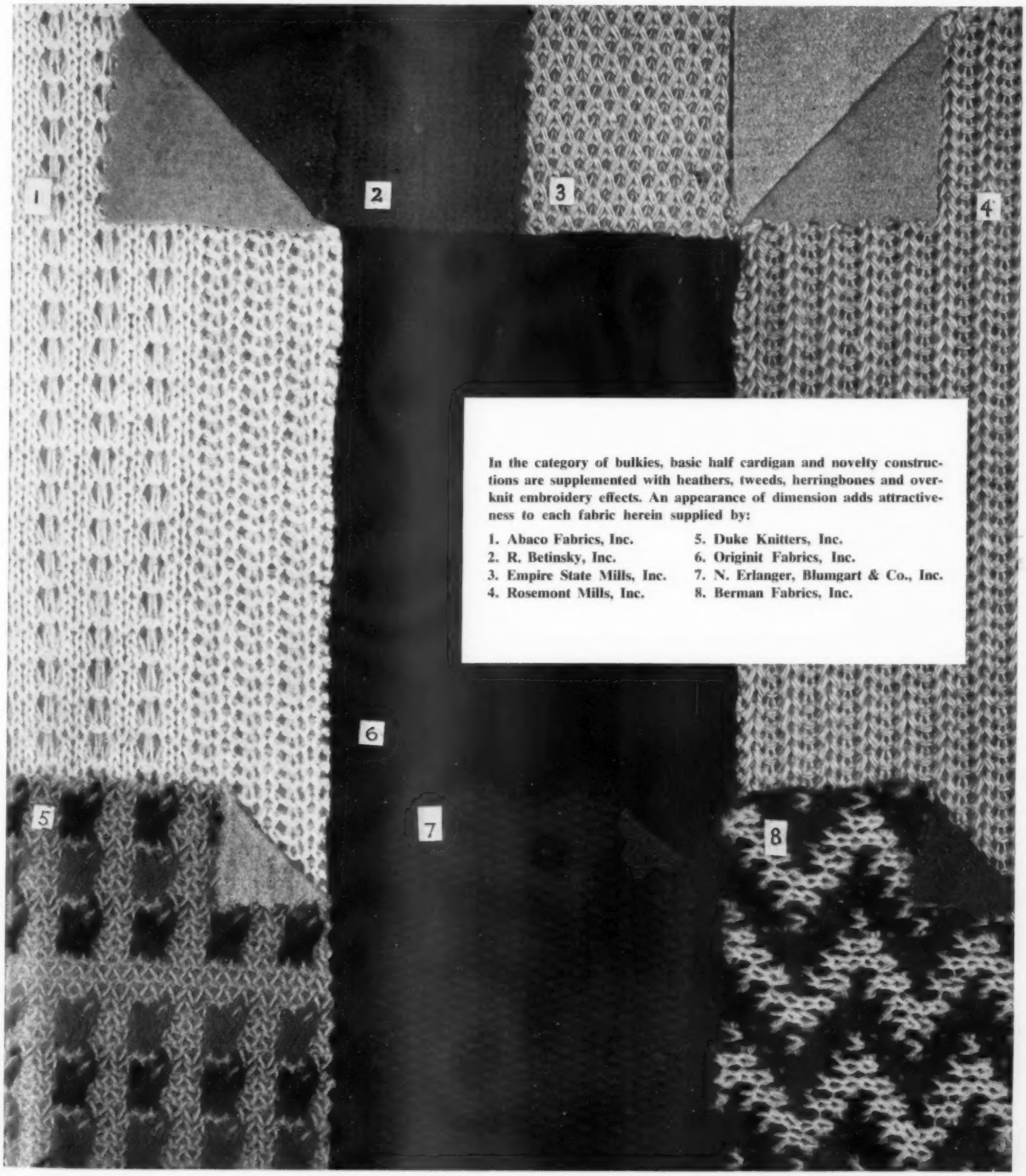
Laminated Knits

Outerwear Is Enlivened With The Latest In Bulky Knits



In the category of bulkies, basic half cardigan and novelty constructions are supplemented with heathers, tweeds, herringbones and overknit embroidery effects. An appearance of dimension adds attractiveness to each fabric herein supplied by:

1. Abaco Fabrics, Inc.
2. R. Betinsky, Inc.
3. Empire State Mills, Inc.
4. Rosemont Mills, Inc.
5. Duke Knitters, Inc.
6. Originit Fabrics, Inc.
7. N. Erlanger, Blumgart & Co., Inc.
8. Berman Fabrics, Inc.

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The swing is to Perma-Bond because knitters get superior foam and far more expert laminating . . . the result of our years of diversified laminating experience.

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No wonder we've had to expand from 20,000 square feet to over a quarter of a million! This is proof that the swing is to Perma-Bond. Get in the swing on your knitwear...phone or write today.

A. D. GOSMAN, INC.

Pioneer Laminators and Sole Makers of Perma-Bond

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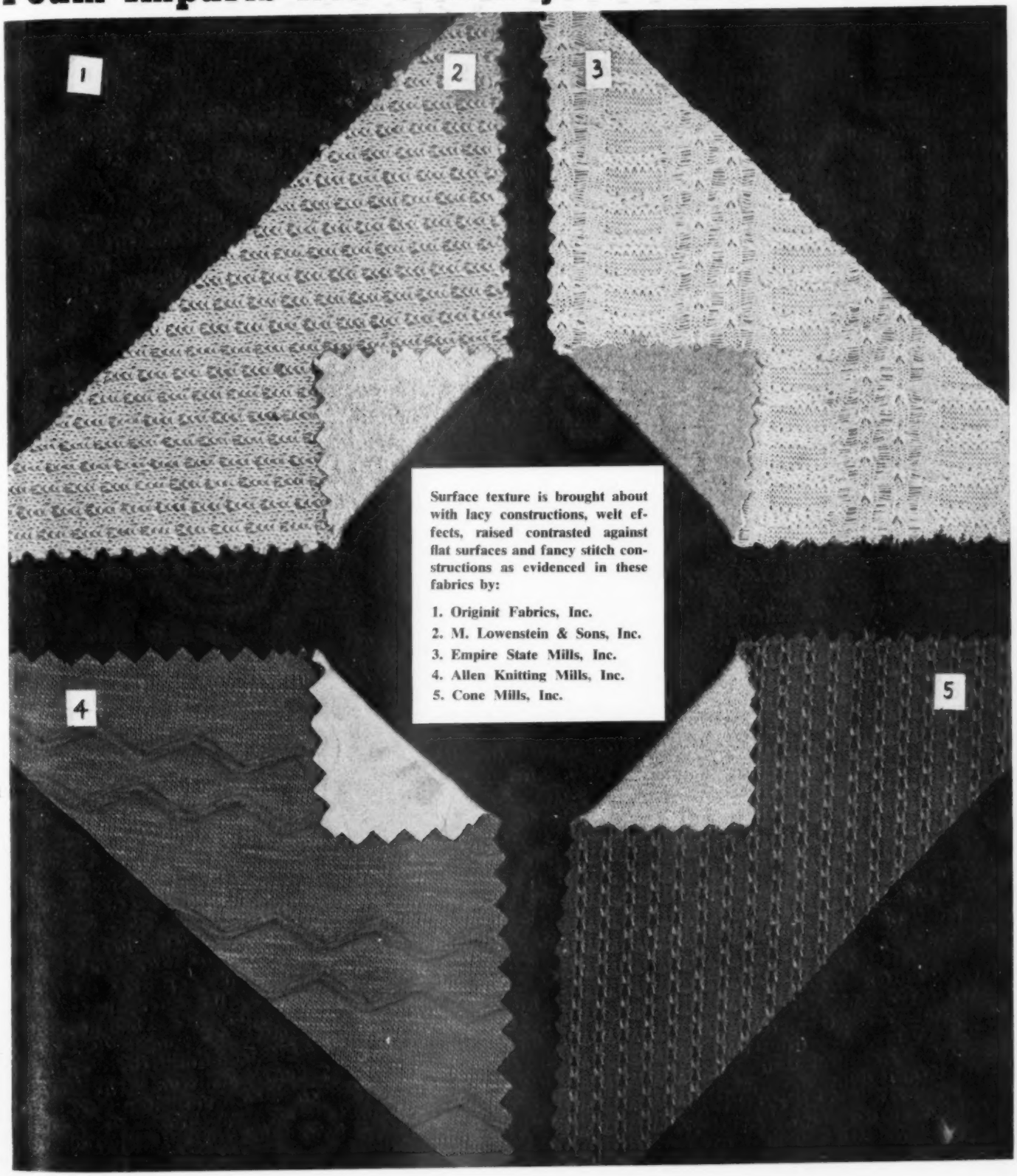
2 So. Broadway, Lawrence, Mass.

Laminated Knits

Foam Imparts New Stability To Textured Novelties

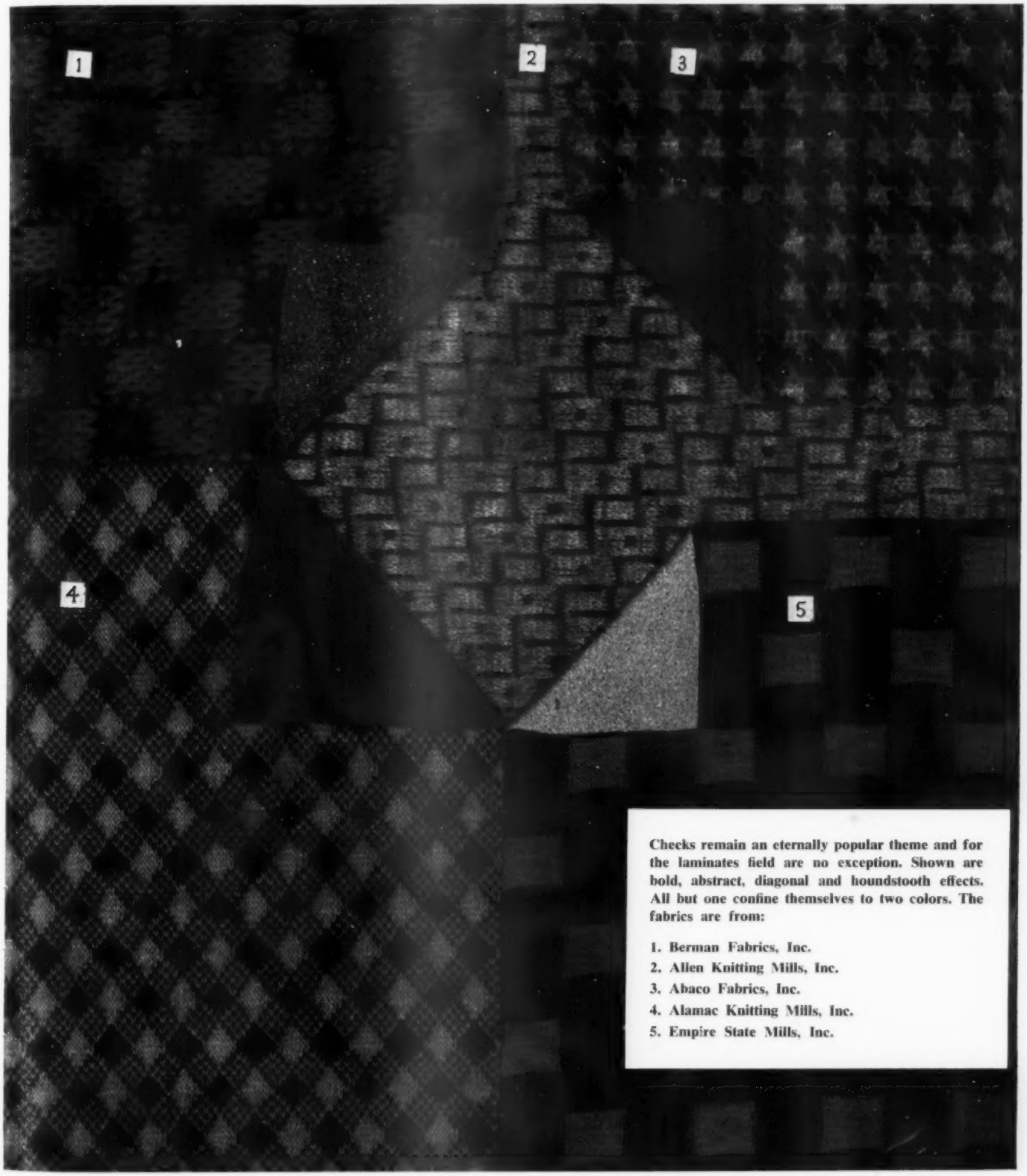


Surface texture is brought about with lacy constructions, welt effects, raised contrasted against flat surfaces and fancy stitch constructions as evidenced in these fabrics by:

1. Originit Fabrics, Inc.
2. M. Lowenstein & Sons, Inc.
3. Empire State Mills, Inc.
4. Allen Knitting Mills, Inc.
5. Cone Mills, Inc.

Laminated Knits

Basic Check Motif Inspires Many New Interpretations



Checks remain an eternally popular theme and for the laminates field are no exception. Shown are bold, abstract, diagonal and houndstooth effects. All but one confine themselves to two colors. The fabrics are from:

1. Berman Fabrics, Inc.
2. Allen Knitting Mills, Inc.
3. Abaco Fabrics, Inc.
4. Alamac Knitting Mills, Inc.
5. Empire State Mills, Inc.

Laminated Knits Review

How Polyurethane Foam Is Manufactured And Used

By JOHN W. HULL
Sales Manager, Urethane Chemicals
National Aniline Division, Allied Chemical Corp.

CLOTHING is one of the most recent and perhaps the fastest growing application of flexible urethane foam. The lamination of various fabrics to thin sheets of foam has created an entirely new technology in the urethane industry. To ensure that fabric mills receive the best possible urethane foam, basic urethane chemical suppliers, such as Allied Chemical's National Aniline Division, and foam manufacturers are continuously seeking new ways in which to improve and control the properties of urethane foam.

The fundamental ingredient for making urethane foam is toluene di - isocyanate. This chemical is combined with either polyethers or polyesters to form a urethane polymer, which is then expanded into a foam by carbon dioxide evolved from the reaction of toluene di-isocyanate and water.

Flexible urethane foams result when the di-isocyanate is reacted with polyesters or polyethers of low hydroxyl content. Rigid foams are formed when the di-isocyanate combines with polyesters or polyethers of high hydroxyl content. It is possible to vary urethane foam hardness from very soft and flexible to very hard and rigid.

Practically all of the flexible foam used in fabric laminates is made with di-isocyanates and polyesters. Softer flexible foams can be made by using Genetron fluorocarbons—the same chemicals that are used as aerosol propellants—to form part of the gas for foaming the urethane polymer.

Catalysts are added to the foam system to control the many complex chemical reactions which are required to make a good foam. Surface active agents are also incorporated to control the foam cell structure.

Flexible urethane foam for clothing laminates can be continuously produced by mixing and pouring the foam components on a moving conveyor belt. The speed of the belt is controlled so that the foam rises to a uniform height just before it enters the curing ovens.

As the cured foam bun comes out of the oven, it is sawed into convenient lengths and moved on to trimming machines which remove the tough outer skin. The skinned buns are then cut into thicknesses corresponding to their intended end-use. For laminates, the slab stock is cut into sheets about 3/32nds of an inch thick, and these sheets are heat laminated to the fabrics.

Flexible urethane foam is also produced in slab stock for the furniture and bedding industries, which consume the vast majority of the foam.

The path that urethane foam follows in the clothing industry starts with basic urethane chemicals such as produced by Allied Chemical's National Aniline Division. Foam producers react these materials to give slab stock, which is cut up into thin sheets. These sheets are sold to fabric mills or laminators, where the sheets are laminated to the desired clothing material. The laminates are bought by clothing manufacturers, which turn out finished articles for sales to retail outlets.

In addition to laminates for furniture and bedding, flexible urethane foam is widely used as a cushioning and packaging material. Urethane foam can be either molded or die-cut into custom-made shapes for specific applications.

One of the biggest applications of molded flexible urethane foam is contoured seating for automobiles, buses, tractors, furniture, and auditoriums. With the molding technique, it is pos-

(*Continued on Page* 28)

sible to make seating and other articles in an unlimited number of styles and with tailor-made cushioning properties. Among the latest innovations in molded foam seating are completely molded urethane foam chairs. Upholstery fabric is fitted over the foam body and wooden legs are screwed on.

Three-dimensional foam cutting techniques use dies made from wood and metal to compress foam slab stock. Part of the distended foam is cut off by a saw, and when the die is removed, the foam takes the desired shape. Foam products now being made by the 3-D die cutting process include case liners, material handling containers for electronic parts, packaging and cushioning devices, and novelties such as soap dishes, toys, head rests, arch supports, and gas pedal covers.

The same insulating qualities that make urethane foam ideal for lamination to fabrics also make it superb for insulating refrigerators, freezers, refrigerated truck trailers, railroad tank cars, piping, and storage tanks. In these applications, however, rigid urethane foam is used.

The thermal insulating efficiency of rigid urethane foam is doubled when Genetron is used as the foam blowing agent instead of carbon dioxide. Foams of various densities are obtained by adjusting the amount of Genetron used in the formulations.

Refrigerators and refrigerated truck trailers are being insulated by pouring rigid urethane foam into panels and other voids in the assembled unit. Presently, the biggest potential of urethane foam insulation is in home refrigerators and freezers where the foam's superior insulation properties allow the construction of thin-walled units with much greater food-holding capacity than conventional models. A number of firms are now marketing refrigerators insulated with urethane foam.

Rigid urethane foam sandwich panels are used in making mobile homes, prefabricated walls or house and factory, and frozen food lockers.

Spraying urethane foam, regarded as a gimmick of little commercial importance until

(*Continued on Next Page*)

about two years ago, is now being used to apply flotation to boats, fabricate temporary shelters, and insulate storage tanks, railroad tank cars, and other large objects where the application of conventional insulation materials has been found to be more expensive and less effective. For many applications, e.g. storage tanks, the cost of urethane foam insulation sprayed in place is significantly less than that of more conventional materials.

The spraying technique consists of combining and mixing the foam components in the head of the spray gun and then discharging the foaming mass as a spray by means of compressed air.

New 1-Package Adhesive Developed For Laminating Knit Cloth To Foam

EAST RUTHERFORD, N. J.—Custom Chemicals Co., Inc. has recently developed a series of one-package adhesives, resistant to washing and dry cleaning solvents (including perchloroethylene and trichloroethylene) for the wet laminating of fabrics to polyurethane foam or to other fabrics.

Richard H. Flicker, president of Custom Chemicals, reported that laminates produced in several plants utilizing these adhesives have possessed excellent bond and hand properties which have remained unaffected through ten dry cleaning and washing cycles.

Mr. Flicker further reported that use of Custom Chemicals' new adhesives, would lower the cost of laminating significantly, for there is no loss of foam thickness due to fusion, nor are there any royalties or license fees to pay. Furthermore, greater flexibility is provided by the fact that bonds of fabric to fabric and foam to water-repellent treated fabric may also be obtained. Of particular importance is the fact that polyether as well as polyester type polyurethane foams may be used.

Laminators, he said, will be greatly interested in the ease of application claimed by Custom Chemicals. Being one-package systems, these adhesives have unlimited package stability and do not require the addition of catalysts or other additives. They may be applied by roller coating, spray or rotogravure. So great is the adhesives' initial tack, that one station of nip rollers, in lieu of continuous pressure, will suffice. Most important, these adhesives do not require any heat for curing. They air dry and once free of volatiles, they have developed their resistance properties. Some heat, however, can be applied to expedite drying. Since elaborate machinery is not required, most laminators may use existing facilities or install new equipment at modest cost.

Acrylic Adhesive Developed By Alco

PHILADELPHIA, Pa. — The Alco Oil & Chemical Corp., here, has introduced a variety of quality adhesive compounds based on acrylic interpolymer latexes.

Frank D. Andruss, president of Alco, said the adhesives have been specifically developed for the bonding of polyether or polyester foams to various types of textile fabrics.

A great advantage of Alco's foam-to-fabric adhesives, according to Mr. Andruss, is that there is no foam loss as in fusion processes, and more flexibility of the finished product.

However, he said, requirements of the finished product will determine both the method of application and the desired viscosity to be selected. Because these are quality adhesives, only the smallest quantities are required for a successful lamination, he added.

All adhesives, explained Mr. Andruss, are applied directly to the polyurethane foam by spraying, roller coating, striping or rotogravure procedures. Recommended heating time and temperature is three to 10 minutes at 280 to 300 degrees F.

Mr. Andruss offered the same thought as other manufacturers of adhesives, "The excellent results of bonding without fusing will, in long range planning, compensate for expenditure involved in a change-over to this new process."

Laminated Knits

Cite Advantages Of Adhesives

PHILADELPHIA, Pa. — E. W. Heller, president of the Manufacturers Chemical Co., Inc., Camden, N. J., near here, makes a comparison between a widely used method of laminating fabrics to foam through heat sealing and a new water-based adhesive, developed by his company, which can be applied to foam or fabric.

In the first system, Mr. Heller explained, laminating results are accomplished by passing the foam over a hot flame so that it in effect melts and that in this molten condition the fabric is pressed on. After it is cooled a bond results, he added.

He pointed out that the fusing consumes about one-third the original foam thickness and forms a bond only as strong as the original foam.

After his company's product, Maniflex No. 789, is applied to the foam or fabric, the two materials are pressed together under heat which evaporates the moisture present in the product.

"Laminates formed with our product," said Mr. Heller, "will resist dry cleaning and, in most cases, laundering. He also said that no licenses or royalties are required for the use of this new adhesive product.

Mr. Heller confided that Maniflex No. 789 has certain limitations, but in most cases is very effective. Other than the effectiveness of his product, he stressed its low cost, pointing out that only a small quantity of Maniflex is required. This makes the applied cost considerably lower than the cost of the foam which is destroyed in fusing.

Normally most laminators, he said, are using 3/32-inch foam and lose about ⅓ in fusing with the result that they end with 1/16-inch laminated foam.

"We know that we have an excellent product for bonding without fusing," said Mr. Heller, "but we also know that adequate laminating equipment is necessary for the use of Maniflex."

Most of the laminators, he pointed out, would have to convert present equipment or purchase new equipment to handle this water emulsion adhesive. It is necessary to dry the moisture present in Maniflex and this only can be done with adequate heating areas.

The Liberty Machine Co., Paterson, N. J., according to Mr. Heller, has developed a compact unit for wet laminating.

Thiokol Chemical Sells Adhesive For Laminates

BRISTOL, Pa. — Urethane adhesives for laminating foam to textiles are being marketed by Thiokol Chemical Corporation. Trademarked Unithane adhesive 200, the adhesive is used for adhering foam interlinings to cottons, synthetics, knits and other fabrics used for apparel.

A stable, one-package urethane base adhesive, Unithane adhesives are activated on the application of heat, providing a high strength bond. Properties afforded by the adhesive, according to Thiokol Chemical Corporation, include ease of handling, high degree of initial tack, excellent hand and resistance to dry cleaning solvents.

Other features reported by the Trenton, N. J. firm: no strike through of the adhesive; no puckering or rippling of foam lined fabric and no delimination after washing or cleaning.

Verona Dyestuffs Has Laminate Adhesive

UNION, N. J. — Verona Dyestuffs has released an adhesive system for lamination purposes, which originates from Farbenfabriken Bayer, Leverkusen, Germany. It consists of two main compounds, Impranil CHW, which is a modified polyester, and Imprafix TH, which is an isocyanate.

The two compounds are mixed in a proportion of 1:20, immediately before use and are then applied by the usual techniques. The products are dissolved in solvents and after drying, in order to remove the solvent, the resin system will crosslink by itself. Complete cross linage is accomplished after one to two days storage at room temperature so that no special curing is necessary.

The film obtained by these resins is fast to washing and dry cleaning.

Laminated Knits Review

Cravenette Water Repellent Finishes Applicable To Foam-Back Knitwear

Water repellents are playing an increasingly important role in laminated knit fabrics, according to John M. Senesac, promotion and sales director of the Cravenette Company. Water repellent finishes, such as Cravenette LK, he said, are ideal for all types of foam-bonded outerwear garments of knitted construction.

"This type of water repellent finish," he added, "is particularly desirable because it does not affect fusing of the polyurethane foam to the knitted fabric and, once bonded, will not adversely affect the fabric's bond strength." This, he noted, is in marked contrast to silicone water repellent finishes which he explained, cannot be applied in advance to knitted fabric destined to be bonded to urethane foam.

In addition to Cravenette LK, Cravenette Company, according to Mr. Senesac, also markets a Cravenette silicone type of water repellent finish. This finish, however, like all silicones, has to be applied to the knitted fabric after flame lamination.

The trend today, he pointed out, is increasingly to the application of silicones after foam-to-fabric fusing because of the increased durability of this type of water repellent agent when applied in this manner. Another advantage of application of Cravenette silicones after finishing is that sewability of the fabric is considerably improved.

Knitters using Cravenette silicone, Mr. Senesac observed, can tie in with the Cravenette Certified Quality Guarantee program. This program assures life-of-the-garment guarantee for the water repellent finish and is backed by 5,180 Cravenette weatherizing stations located across the country. These units will reprocess without charge any garment if the Cravenette durable water repellent finish failed to withstand repeated cleanings as certified by Cravenette Quality Guarantee.

To further assist knitters participating in the Cravenette durable water repellent finish program, the company has a staff of technicians to work with laminators and suggest proper equipment and train laminator's personnel in the application of these water repellent finishes.

Rigid Control Basis Of Nopco Quality

(*Continued from Page* 17)

as the largest urethane foam producer in the world.

Tremendous growth has been experienced in the past year in the field of foam for knitted goods and there promises to be virtually a fashion revolution in fall knitwear created by foam-laminated garments.

Even though 1960 was the first year in which any appreciable quantity was produced, foam-laminated knits have taken the apparel trade by storm in this and many foreign countries. Foam, being hailed as the biggest fashion news since discovery of synthetic fibers, is radically changing many clothing habits.

New Markets

New markets will evolve as the industry experiments and tries new applications. And changes in consumers' thinking habits will come about as foam-fabric laminates continue their progress. Much of the change will come as more people are exposed to foam in their own clothing, but it also comes down to a matter of consumer education—a problem in which the entire industry must participate.

High Standards

The industry also must strive toward maintaining high standards of quality and toward improving every aspect of foams to guarantee the future of the foam interlining concept. Through a program similar to the one self-imposed upon itself by Nopco, such guarantees of quality should come about for the benefit of the industry and the consumer alike.

Knit Laminates Review

Pratt Sees Field For Knit Foam-Backs Still In Infancy; Growth Expected

PHILADELPHIA, Pa. — "We've only scratched the surface in knit foam laminates," said Leonard C. Pratt, Jr., president of Rosemont Knitting Mills, Inc., here.

Mr. Pratt looks upon lamination as a tremendously challenging adjunct to the field of knit goods. However, he readily admits that production problems do occur but that Rosemont manages to neutralize them in record time.

Rosemont, with a little more than three years in the laminated field, has been accepted as a pioneer in the Philadelphia area. For the past five months the firm has been doing its own lamination. Prior to that, the work had been given to outside contractors.

Of the many developments under way at Rosemont one in particular, called sandwich laminating, has warranted industry-wide attention. A sandwich laminate is a sheet of foam with fabric bonded to each side. Presently, two laminating steps are required, one for each fabric. But Mr. Pratt said he expects a process to be developed shortly in which two fabrics can be laminated to foam at the same time.

As he sees it, there is no type of fabric which cannot be used successfully with the foam. The best consumer feature of the laminated process, Mr. Pratt pointed out, is that it gives warmth without weight.

"But of great interest to the industry, is the fact that it allows knit goods to be processed, cut and tailored in the same manner and just as efficiently as woven goods. At the same time, laminating stabilizes a fabric which in turn results in good tailoring.

One of the early problems of lamination concerned the sewing of the fabric. Knit goods would not slide easily in the sewing machines. This was solved by placing a coat of Teflon on the platform and another on the base of the sewing machine, and also by spraying silicone on the table.

More than 100 knitting machines are housed in Rosemont's 25,000 square feet of plant area.

Since its introduction at Rosemont, production of knit laminators have risen 300 per cent.

Donnybrook's Coat Line Has Laminates

Donnybrook, Ltd., manufacturers of misses coats, and their junior line, Donny, Jr., have incorporated several knitted laminated coats in their collections for fall and winter.

Fabrics highlighted all wool and wool and cotton heather tweeds and a brushed nylon knit available in several solid colors. Constructions for the former are a basic rib and a boucle type knit.

Coat styles include single breasted straight and flared numbers with classic roll collars. Most have patch pockets or pocket flaps placed below waist level for special interest.

Of the flared coats in rib knit, one has a zip out plaid lining and the other reverses to woven plaid. Long detachable neckscarves of the plaid fabric add further interest.

Two coat styles are offered in the boucle construction. One has a cape back and Orlon pile lining and the other is a flared three-quarter model. Both have the low slung pocket detail.

A stunning all wool three-piece outfit has as one of its componet parts a three-quarter knit laminated coat detailed with low pockets. Also part of this outfit is a woven skirt in a giant houndstooth check and a knitted overblouse in the same rib construction as the coat. The blouse is banded at the jewel neck and tied at the waist with the skirt fabric and features short sleeve into bodice styling.

Two nylon suede numbers are found in the Donny Jr. line. One is a flared coat available in solid high shades of gold, scarlet, whippet, moss green and navy. It has a pile lining of woven sherper and features interesting yoke detail both front and bath.

The identical yoke detail is found on a three-quarter poncho coat. Also flared, this number has double saddle stitching along all borders and pocket flaps and is offered in the same color range as the preceeding number.

Laminated Knits Review

Jantzen To Expand Foam-Backed Line; 'Big Future' Expected For Laminates

PORTLAND, Ore. — Laminated knit outerwear jackets are found in both the men's and women's autumn, 1961 lines, of Jantzen Inc., and Mayer Monroe, vice-president and director of designing and merchandising, foresees a great future for the laminates with a much wider use ahead, as materials and processes are changed and improved to make the garments even more desirable and marketable.

Herbert Zell, director of merchandising for Jantzen's men's division, also expresses the belief that the movement toward foam lamination is "just getting off the ground," with major accomplishments yet to come.

The earliest of the laminated knits, Mr. Monroe said, were thick, heavy and bulky. The thinner foam, now in use, offers much more attractive possibilities, he feels.

Jantzen is currently offering four knit-laminated jackets in the men's line, and two in the women's. Each of the latter has its matchmates in the men's lines. Most of the Jantzen styles are reversible.

One of the matchmated styles is a new version of the Canadiens — an established favorite of previous seasons—with vertically striped body and horizontally striped sleeves. This is the only one of the laminated styles which does not reverse.

In the women's line, the outer shell is of tow-dyed Orlon, laminated to polyurethane with lining of Antron. Acrilan knit trim is used for a shawl-type collar and cuffs.

Color combinations include striping of bone, olive, chianti and wild blue, with black cherry trim and charcoal lining; chestnut, gray marl, white and orange rust striping, with chestnut trim and brown lining; antique gold, redberry and tartan green stripes with black lining and trim; and antique gold, white and wild blue stripes with medium charcoal trim and gold lining.

The women's Tarleton jacket presents a three-color Scandinavian-type jacquard pattern in three different combinations—golden olive, navy and orange; steel green, wild blue and new copper; wild blue, antique gold and redberry; and medium charcoal, taupe and tartan green. These reverse to brown, navy and black, respectively, in the form of an inner shell of water-repellent Antron nylon. A rather sizable, heavily-ribbed collar matches the body color of the garment.

An exception to the patterned character of the Jantzen laminates is found in the men's line, in a reversible solid-color jacket with nylon knit exterior which reverses to an Antron nylon inner shell.

In the men's line, the patterned outerwear jackets are duplications of fabrics used for sweaters in the line—including the men's Tarleton style from the Highlander brushed shag group, presented in combinations of three colors.

In addition to this and the men's Canadiens striped style, there is another jacket in a jacquard pattern of Scandinavian-type design.

Mr. Monroe has high praise for the comfort, wearability and excellent insulation characteristics of the foam-laminated garments in their present versions. In the field of possible improvements, he feels that a little more suppleness might represent a desirable direction for future explorations to take.

Corval-Acrylic Blend Is Laminated By Allen

Foam laminated knits of 50 per cent Courtaulds crimped Corval and 50 per cent acrylic fiber are available in a multitude of clear, bright colors in the Allen Knitting Mills line.

The fabrics sell for about $1.80 when laminated to Scott Apparel foam and $1.65 with Vomar foam.

Knit fabrics containing Corval blended with Arnel, cotton, Orlon and wool are being developed.

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Laminated Knits

Scott Foam Show Highlights New Foam-Back Styles

The fashionable and practical application of synthetic plastic foam to both knitted and woven fabrics was the theme of a showing in which both classic and novelty garments from a wide array of manufacturers were presented. Sponsored by the Foam Division of the Scott Paper Co., the object was to demonstrate the extensive possible use of laminates in various segments of women's wardrobes for the coming year. The usual qualities and characteristics of foam laminated garments such as warmth without weight, durability, easy handling, easy care and permanent shape retention were frequently mentioned.

Laminated coats and jackets constituted the major portion of the show, but a swim suit and poncho cape were samples of novelty numbers. Another use for laminated fabrics is in house slippers and shoes, and Scott-foam featured shoes by Sandler to demonstrate this possibility.

The laminated swim suit was by Jantzen in black bulky knit. A band of linked daisies encircling the hips was the sole detail on both the suit and its matching unlaminated sweater.

Princeton Mills was the fabric resource for two capes which were made of their Purr-Suede fabric—a brushed nylon knit. The first, by March and Mendl, was lined with Orlon pile and had a toggle closing. The second, a poncho cape by P.R.L. was lined with black taffeta.

Princeton also supplied fabrics for two unusual tweed suits, both marketed by the Donny Jr. Division of Donnybrook, Ltd. A three-piece ensemble in pumpkin had a tweed jacket and lined gored skirt. The allover stripes on the overblouse found their way to the turnback cuffs on the jacket, thus providing a point of transition. The second suit, with the same stripe detail, had an elongated jacket that classified it as a walking suit.

Brushed nylon knit, which has the look of suede, appeared as the most popular fabric for outerwear. Amdur-De Marco used Abaco sueded fabrics for a white single breasted coat with slash pockets and diagonal seaming on the back yoke and a black braid-trimmed coat with a fleecy surface.

Stella Stevens wears this Abaco Bonda Knit skirt and coat in the forthcoming picture "Too Late Blues." Designed by Edith Head, the laminates are knitted of 100 per cent Orlon in a fine gauge half cardigan stitch. The coat is by Sunset House, Los Angeles.

Solids in brushed nylon knit by Princeton for Donny Jr. were a classic olive heather trimmed with black braid and a full ⅞ with yoke back. Another was navy Purr-Suede that reversed to a red and blue plaid Orlon pile.

High style laminated coats included a full coat in magenta with removable black fox collar by Chadwick and a white wool paisley print with a standaway collar by Halldon.

Two classic 80/20 Orlon and wool laminated knits were by Crescent Sportswear, Inc. One, a Continental-styled waist length jacket had welt seaming and notched sides. Black braid trimmed a basic jersey coat in bone, red or black.

Laminated jackets span the four seasons because of their innate characteristics. Highlights of the jacket collection included an Aran Island patterned cotton knit by Abaco for Chadwick. Its raccoon collar was removable and a pile lining also zips out for warm weather.

Other jackets made of Abaco fabrics included a flat rib knit

(*Continued on Page* 43)

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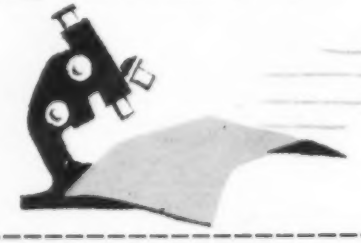

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with jewel neck and a brushed nylon rib knit both for Frank Lee of California.

Bulky Trim

Bulky knit trimmed an Antron nylon ski jacket laminated to Scott Apparel Foam. By Duofold, Inc., it was worn with a Viyella turtleneck shirt and came in scarlet, black, martini and olive.

Other ski jackets were by White Stag in cotton or wool knit in solid colors and fine Scandinavian jacquard designs. The warmth plastic foam imparts to a fabric without giving it extra weight allows lightweight cotton and wool to be used for such outerwear jackets.

For London Fog, Princeton Mills' 80 per cent Orlon, 20 per cent wool jersey fabric is used for a classic single breasted polo coat.

Heather Tweeds

Princeton's beautiful heather tweeds are laminated for two coats by Main Street Fashions. One very warm but lightweight coat was in green heather with wood buttons marking its double breasted front. A plush pile lining added further warmth and good looks. The sleeves on the other were very full so as to create nearly a cape effect. Large pockets were placed toward the lower edge.

In its showing, Scott Apparel Foam demonstrated through a great number of standard and novelty garments only the beginning of all that can be done with laminated fabrics in both knitted and woven constructions. Many additional pieces were shown, but they tended toward the classic styles in brushed nylon suede, rib knits and 80/20 Orlon and wool jersey blends.

Strong Interest In Laminates Noted On Coast

By VIRGINIA CORNING

PORTLAND, Ore. — Pacific Northwest manufacturers and consumers are evidencing a real enthusiasm for foam-laminated knitted outerwear, which has soared into prominence here during the past year in both men's and women's lines.

Women's sportswear and coat departments in Portland at present are displaying jersey coats laminated to foam in a wide assortment of colors, as has been the case for some months now.

Men's stores and departments, too, are displaying extensive new stocks of jackets which are replacing the earlier shipments.

Not only are such major Portland-headquartered manufacturers as Jantzen and White Stag offering the laminates in their fall sportswear and skiwear lines, both for men and women; but a number of other Pacific Northwest manufacturers have recently added men's outerwear with foam lamination—among them Pacific Trail in Seattle and Columbiaknit in Portland.

Pacific Trail Sportswear's fall line for men and boys includes polyurethane foam laminated to nylons, Orlons, bulkies, suedes and jerseys. The laminated fabrics are described by the company as leading the way in the sales figures.

In addition to solid color outerwear jackets, a reversible blouse-length jacket in a two-color Scandinavian pattern is described as a fast-selling item. It is in Orlon knit with Vomar foam, and reverses to plain-color poplin. The latter, turned over to make a color, furnishes a note of solid contrast to the all-over pattern of the outer shell.

A newly organized manufacturing business in Seattle — Victoria Sportswear, Inc. of the Pacific Northwest — is making not only foam-laminated outerwear jackets of Orlon knit, but even offers jersey knit vests in a variety of colors—of 80 per cent Orlon, 20 per cent wool, laminated to plastic foam.

At present, there are no facilities whatever in this section of the country for handling the lamination of foam to fabric. Consequently, western manufacturers are of necessity obtaining their laminated fabrics from resources in the eastern part of the nation. This may in some instances act as a limiting factor on the volume sold, when such sources are unable to provide reorder quantities of specific fabrics or garments.

Laminated Knits

Upstate Stores To Promote Lines Of Foam Backs

SYRACUSE, N. Y.—Laminated knit garments for women, which made a brief and somewhat uncertain appearance in the four leading department stores and two top specialty houses here this spring, are expected to become a more basic part of the fashion picture this fall.

Buyers, fashion coordinators and merchandise managers tell of varied experiences according to the depth in which they stocked the garments, but all agree that the new laminated fabrics have "great possibilities" for the near future.

"This spring, it was a fad that lasted about six weeks," reports the sportswear buyer of one department store. "The lightness of weight is good. It makes a sophisticated garment and if the dry cleaning problem can be solved, it should definitely become basic very soon." The Balmacaan was the most popular of the several styles stocked in red, beige, black and navy, priced from $14 to $19.98, she added.

The buyer of womens' coats in the same department store carried toppers and raincoats from $25 to $35 and is looking forward to cable and other novelty type stitches offered in the fall lines.

One popular-price department store stocked laminated jersey coats at $19.90 and $25. The latter sold better although there was no special promotion. The coat buyer in this case had already ordered a $39.98 retailer with mouton collar trim for early fall and predicts black will be the best color with red second and emerald green third in favor. Good tailoring is a requisite, she claims, "even for the customer on a limited budget."

The fashion coordinator of another department store included laminated outerwear in noontime in-store fashion shows for career girls and believes these garments will "come into their own" this fall. As far as dry cleaning is concerned, she says, "Everything is so well ticketed today, I'm sure the manufacturers will come through with proper information as we get further into these new fabrics." But, she observes, all the national fashion magazine articles notwithstanding, it is still vital that every member of the retail sales staff be informed and able to answer customers' questions intelligently.

The women's ready-to-wear merchandiser of another department store chain describes their spring season in laminated knits as one that "opened up well but then died real fast." Involved mainly was rainwear priced from $20 to $30. This merchandiser says he plans to test the garments at the very outset of the coming season, subject them to plenty of promotion via newspaper advertising and windows and "if they catch on better, we'll go into these lines more heavily."

Car coats at $29.98 and raincoats from $19.98 to $35 "went very well" this spring at one specialty shop, with laminated knits expected to reappear in greater depth in the fall. Repercussions were reported, however, in drycleaning because "the smaller cleaners didn't want to take the responsibility." In this shop, mimeographed cleaning instructions provided by the manufacturer were given to customers at the time of purchase.

The other top specialty house had "very good results" with a $29.95 raincoat.

New Firm Is Laminator For Originit Fabrics

A firm that processes and laminates fabrics for Originit Fabrics, Inc., has been formed by Robert J. Singer and Milton L. Reiter, Originit, and Daniel Gross, formerly of Velveray Corp.

Laminated Fabrics of New Jersey, Inc., has a 60,000 square-foot plant in Passaic, N. J., which Mr. Gross, a mechanical-textile engineer, is in charge of.

Originit's offices at 991 Sixth Avenue will be the New York City headquarters for the new firm. Mr. Singer is president of the new company; Mr. Reiter, secretary, and Mr. Gross, vice president and treasurer.

Texturized Yarns

Textile Institute Conference Papers Summarized—Part 2

HARROGATE, England—Following are digests of the four additional papers presented at the Textile Institute Conference on bulked yarns held here recently. In the first section of this two-part series (See KNITTED OUTERWEAR TIMES, June 12 issue) two papers, The Technology of the Production of False Twist Textured Yarns and Terylene Bulked Yarns, were abstracted.

Bulked and Stretched Yarns of Nylon 66 Produced by the False Twist Process. Two technologists from the Hosiery and Allied Trades Research Association, K. Vidhani and T. S. Nutting, presented this paper. The majority of the new bulked and stretch yarns, they said, are evaluated in the knitting industry and, judging on past performance, it is in this industry that most of the new yarns will be used. Therefore, the paper was concerned with yarn characteristics and their effect on knitted fabric properties.

The various commercial machines available for producing bulked and stretch yarns all control the turns per inch of the false twist inserted and control the temperature of the yarn heater unit. A third factor, controlled by rollers or some other device, is yarn tension.

The modern range of controls available permits the production of a great variety of yarns, this variety being further increased by post-heat treating the false twist yarns.

Difference Noted

To avoid confusion the authors called normal false-twist yarns parent yarns; after subsequent modification, post-treated yarns. In view of the great number of yarns which can now be made it was felt that an attempt to classify yarns by measurable parameters would be worthwhile.

In the experiments described nylon 66 type 100, 70 denier, 34 filament of one merge was used. Parent and post-treated yarns were processed on a Scragg C.S.1 Crimp Spin unit operating at a spindle speed of approximately 37,000 r.p.m. Nine inch enclosed contact heaters were used and false-twist spindles were removed during processing of the post-treated yarns.

The false-twist yarns used were produced at a fixed overfeed of three per cent. Heater plate temperature was varied (with false-twist fixed at 80 t.p.i.) between 145°C and 251°C, and then the false-twist was varied between 45 and 80 t.p.i., with the temperature constant at 212°C. Thus, the number of variables was produced.

Varying Conditions

In the investigations into post-treated yarns some specimens were reheated with a fixed heater plate at 212°C; some specimens were reheated to the same temperature as used in their production. Both these sets of specimens had been false-twisted at 80 t.p.i. A further set, with varying degrees of false-twist t.p.i., was reheated to 212°C.

To investigate yarn relaxation, the yarns reheated under the above conditions were subjected to: 10 per cent relaxation during reheating (10 per cent overfeed); 15 per cent relaxation during reheating (15 per cent overfeed).

It was found that increasing heater-plate temperature of the parent yarns increases the Equivalent Steam Setting Temperature. (E.S.S.T. may be calculated from measured residual shrinkage. In the case of nylon 66 it enables the correct choice of fabric setting conditions to be made). Increasing the false-twist produces no real change in E.S.S.T. Increased heater-plate temperature and false-twist both produce an increase in crimp rigidity.

Increasing false-twist produces a steady increase in yarn diameter. At first, higher heater-plate temperatures increase yarn diameter but a peak is reached at 212°C. Above this temperature, yarn diameter decreases.

Increasing twist clearly increases crimp frequency. Increasing heater-plate temperature also gives rise to an increase in crimp frequency. An increase in both causes reduced crimp angle; the crimp goes tighter as frequency increases.

With post-treated yarns, those of the first group reheated to 212°C) with both 10 per cent and 15 per cent overfeed values have E.S.S.T. lying within 118 to 124°C. The second group of specimens (reheated to original processing temperature) respond to increased heater-plate temperatures with higher E.S.S.T. The E.S.S.T. of the yarns with a 15 per cent overfeed factor is always slightly higher, however. Between 235°C and 251°C there is a drop in E.S.S.T.

The third group of specimens (with different false-twist values) with 10 per cent and 15 per cent overfeed factors have the same E.S.S.T. throughout the twist range.

The first group of specimens indicated that crimp rigidity values increase as the value of the parent-yarn heater-temperature increases for both 10 per cent and 15 per cent overfeed. For the second group of specimens, it was apparent that reheating yarns at their original processing temperature stabilizes the crimp rigidity value to a constant level. Crimp rigidity values with the third group increased progressively as the parent yarn false-twist increased.

The authors then went on to describe how comparisons have been made of crimp rigidity of parent and post-treated yarns in respect to yarn diameter, crimp frequency and crimp angles. They outlined experiments concerned with the properties of fabrics made from the yarns under discussion, before giving opinions on one of the major difficulties associated with the evaluation of textile fabrics—that of obtaining a correlation between measurable yarn properties and those fabric properties that are thought to be of importance. This difficulty, it was said, has been aggravated by bulk and stretch yarns.

Yarn crimp rigidity is a measure of yarn contraction. Although it has limitations, its help is invaluable. Crimp rigidity should exercise some control over the relaxed fabric dimensions—high crimp rigidity leading to high stitch density. The combined effect of high crimp rigidity and high stitch density should lead to fabrics which are relatively difficult to stretch—high initial modulus and high loads for 50 per cent extension. One would also expect a relationship between fabric thickness and crimp rigidity.

The relationship between N (N= courses per inch x wales per inch) and crimp rigidity for post-treated yarns is very good, it was stated. If these are plotted, a smooth curve can be drawn through the points. The N values of fabrics from parent yarns produced by heater-temperature variation fit reasonably well, particularly at the higher temperatures. Fabrics produced from parent yarns as a result of false-twist variation do not fit at all well. Fabrics made from low-twist yarns have a disproportionately high N value.

Other points brought out by the authors in their paper were that: Increasing yarn denier for a yarn of given crimp rigidity knitted to a fixed loop length reduces the effective crimp contraction, producing a fabric of lower stitch density. In general, yarn diameter and crimp rigidity advance together and it is, therefore, impossible to separate these effects on fabric thickness to any great extent. Observations seem to indicate that, by placing yarns in a knitted structure, the interlocking of the loops causes the effective yarn diameter to be restricted to an upper limit which will in practice be a function of free yarn diameter, crimp rigidity and knitted loop length.

The authors stated that they felt post-treated yarns of high crimp frequency (low crimp angle) are likely to produce fabrics of better cover and more pleasing texture.

The type of yarn in great demand at present, they said, is one suitable for bulky knit and jersey outerwear, and one which

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can be pre-dyed. Since these goods are not given a wet treatment, yarns used should be very nearly stable (their crimp rigidity should be low enough for full crimp to be developed by a steaming operation or to be almost fully developed after knitting). For these outlets yarns are usually pressure dyed. One can begin, it was said, to deduce general specifications for yarns of this type in terms of crimp rigidity and E.S.S.T. values, if the dyeing conditions are known.

The authors concluded their paper by saying that a large variety of yarns may be produced by the post-treatment of false-twist yarns. Experiments have shown how by altering the various processing conditions yarn properties may be changed. Although the details of the experiments discussed in the paper referred to the CSI type of false-twist unit only, it seems reasonable to assume that qualitatively the results may be applied generally, they said.

For the more stable type of post-treated yarns used as dyed yarns in knitted outerwear the second group of yarns, those post-treated at temperatures equal to that used in their original production, seemed the most remarkable.

Fabrics knitted to a fixed loop length from post-treated yarns have their physical properties mainly determined by the yarn crimp rigidity. Fabric appearance is affected by yarn crimpiness, and this in turn may be altered independently of crimp rigidity by changing the false-twist of the parent yarn.

Knitting of Bulked and Stretch Yarns.—This paper presented by S. Fitton and J. C. Hopkinson, of the Hosiery and Allied Trades Research Association, discussed the results of some experiments in which several types of yarns were knitted at a range of knitting stiffnesses. Four popular fabric structures were used—plain, fancy, interlock, full-cardigan and half-cardigan.

The authors said that the new crimped yarns, and the many new types of structures made possible by them, have accentuated the need for data from which a knitter can predict the properties of a fabric produced at a certain stiffness from a particular yarn.

Various types of conventional, post-treated false twist and ordinary false-twist and Ban-Lon nylon 66 yarns were used, together with some Crimplene.

The plain knit fabrics were produced on a 164 half-hose unit, the interlock fabric on a 20 gauge 984 x 984 needle machine, and the cardigan structures on a 10 cut power flat machine.

Knitting stiffness was described in terms of loop length and was measured by unraveling a sample and measuring course length before wet relaxation and bulking.

Anent plain knit fabrics, the authors said that previous work with yarns substantially stable in dimensions had shown that stitch density, courses per inch, and wales per inch are governed by length of yarn knitted into each loop.

But with the crimped continuous filament yarns used in these experiments other factors present themselves. The yarns are not stable, length and diameter vary with small applied loads.

An extensive table of results was shown. This indicated that:

[c.p.i. — courses per inch; w.p.i. — wales per inch; N — loop per sq. in.; l — length of yarn per loop; L — length of yarn per course; CR — crimp rigidity; k1 — (N x l^2); k2 — (c.p.i. x l); k3—(w.p.i. xl).]

- Yarn contraction increases as the loop length grows, and/or the denier of the yarn increases.
- Rate of increase of k1 with increasing loop length is greater for yarns of high crimp rigidity. Yarns of high crimp strength contract until restricted by space in the fabric.
- In yarns of similar type, level of k1 is higher for yarns of higher crimp rigidity.
- In Ban-Lon fabrics, ratio k2/k3 decreases with increase in cover factor, owing either to increasing loop length or decreasing denier.
- Yarn contraction affects c.p.i. more than w.p.i.
- While weight per sq. yard drops with growing loop length, weight per running yard grows with growing loop length.

A table of results for experiments carried out on interlock fabrics knitted from 2/70 denier nylon and 2/75 Crimplene showed that:

- k1 increases with growing loop length.
- Rate of increase of k1 with increasing loop length is greater for yarns of higher C.R.
- Ratio of k2/k3 drops with increasing loop length, but is higher for fabrics of high C.R. yarns.
- Crimplene yarns, with lowest C.R. and greatest stability, correspond closely in N value with 1/40s cotton knitted to a similar stiffness.

Results for full-cardigan fabrics, knitted from two ends of 2/70 denier nylon and two ends of 2/75 denier Crimplene, show that:

- Except with Crimplene fabrics, k1 increases with loop length. With Crimplene, k1 is constant.
- Higher crimp strength yarn fabrics have higher k1.
- Random variations in k2/k3 values probably reflect the difficulty in obtaining these fabrics in a truly relaxed form. The authors believed that this is mainly owing to the extreme distortion in this structure.
- Notwithstanding certain discrepancies, in general it can be seen that the influence of stitch length is more marked in w.p.i. than in plain and interlock fabrics.
- Changes in C.R. similarly affect w.p.i. and c.p.i. and weight per square yard tends to fall with increase in stitch length. Weight per running yard increases with stitch length for all fabrics except those of Crimplene, where weight per running yard is more or less constant.

A table or results for experiments on the half-cardigan fabrics indicated the following:

- k1 increases with loop length, except with Crimplene fabrics which are generally constant.
- Fabrics made of high crimp yarns have higher levels of k1.
- False-twist yarn fabrics have similar c.p.i. to those of post-treated and Ban-Lon yarns, but have higher w.p.i. and therefore higher N.
- Influence of growing loop length was more marked on w.p.i. than on plain and interlock fabrics, as was varying crimp.
- Weight per yard decreases with increasing stitch length.
- Weight per running yard grows with increased loop length only in fabrics made from two false-twist yarns. Other fabrics appear to be fairly stable in weight.
- Again random variations of k2/k3 values probably indicate difficulty in obtaining this type of fabric in a truly relaxed state.

The authors emphasized that the results had been obtained from a comparatively limited number of experiments.

In an attempt to relate stitch density to loop length, C.R., and yarn denier from the plain fabric results (using the fully bulked C.R. as a measure of yarn contraction) the following relationship was derived:

$$N = 12.7 + \frac{24.6}{l^2} - 0.55D + 9.5\ C.R.$$

where D is denier of yarn

For the three post-treated false-twist yarns used in the interlock fabric, stitch density can be determined from:

$$N = (24 \times C.R.) + \frac{23}{l^2} - 72$$

It was emphasized that these are empirical equations.

In conclusion, the authors commented that the results of their experiments have been sufficiently encouraging to suggest that a profitable line of development work would be a more extensive investigation by a knitter of his product in greater detail along similar lines.

Factors Affecting the Properties of Fabrics Knitted from Bulked and Stretch Yarns.—The authors, D. L. Mundon, J. J. E. Knapton and C. D. Frith, first outlined the development of the knitting industry up to the 1950's and the advent of thermoplastic yarns. They mentioned the initial preoccupation with stretch properties of these yarns, which gave way to a more realistic interest in warmth, weight and other qualities. Then

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they came to the new stretch yarns, those with maximum bulk and minimum stretch, describing the basic method behind most methods of processing now used.

They then went on to the difficulties encountered in assessing the bulking potential of stretch yarns. Yarn bulk is a result of the collapse of the yarn from the straightened condition and at first sight the measurement of yarn thickness and/or yarn collapse when completely released from strain would appear to give the required measurement, they said. But yarn bulk measured in this way always leads to surprising results. For example, a decrease in twist inserted in the yarn usually produces a yarn with increased collapse when completely released from strain. With treatment at lower temperature, a greater separation of the individual fibers is often produced in the fully relaxed yarn. Yet it is known from practice that a high yarn twist and high temperature treatment are necessary to produce a fabric which will collapse to the required degree.

A method of measuring yarn collapse was described. This method differed in several important features from other techniques—the yarn was thoroughly relaxed before its collapsing qualities were measured and measurement was made on individual lengths of the yarn instead of on a hank of yarn.

The collapse measured by this method was compared with that calculated from the degree of collapse in knitted fabric samples. From the results obtained, conclusions were drawn for stretch yarns having high and low percentage collapsing properties.

It was believed that the dimensions of a relaxed fabric are determined principally by the knitting quality or stitch length, by the openess of the structure (ratio of yarn count to stitch length), and by the percentage collapse of the yarn.

Additionally, the authors stated that the collapse of the yarn in the fabric increases approximately linearly with increase in stitch length over a normal range of knitted structures, but under all constructions is less than that obtained by standard methods of measuring percentage yarn collapse.

Under normal knitting conditions, it was said, a change in yarn tension from two to 15 grams may affect the knitted stitch length by up to 15 per cent. On the same machine when knitting under yarn-feed conditions the stitch length is unaffected by change in tension between feed unit and knitting elements, but a change in tension between package and feed unit from two to 25 grams may cause stitch length to change by six per cent. This variation may be reduced to about one per cent if the input tension to the feed unit is not allowed to be lower than 10 grams.

There is some evidence that certain loss of yarn and fabric results when yarn enters the knitting elements at high tension. It would seem the best plan is to use a feed unit with the yarn to this unit controlled between 10 and 20 grams but with a tension of between two and five grams as the yarn enters the feeders.

A Study of the Comparative Comfort Properties of Nylon Bulk-Yarn Knitted Fabrics with Those Prepared from Cotton, Wool and Continuous-Filament Man-Made Fiber Yarns—Presented by three technologists from Fabric Research Laboratories, Inc., Massachusetts, E. R. Kaswell, C. A. Lermond, and L. Barish, this paper described a selected series of tests conducted under laboratory conditions and which, the authors believed, corroborate the opinion that bulked yarn fabrics are in fact more comfortable than fabrics made from continuous filament yarns.

In introducing this paper it was said that the quantity of fiber processed into bulked or crimped textile products has risen, in the United States, from about five million lbs. in 1954 to roughly 60 million lbs. last year.

It was mentioned that comfort is a subjective parameter, which is extremely difficult to correlate with objective physical measurement. The purpose of the authors' work had been to present some quantitative facts concerning the properties of fabrics made from bulked nylon yarn and to propose that because these properties approach those of spun yarn fabrics they are closer to the greater comfort of the latter.

Wool, cotton, bulked nylon, filament nylon, filament acetate, and filament viscose rayon were used in the experiments. The surface characteristics of the test fabrics were studied by photographic methods. Thermal conductivity values were measured for the cotton, nylon, and bulked nylon fabrics using a Cenco-Fitch conductivity apparatus. A Compression Instron Tester was used to measure compressional resilience. The effect of compressional resilience on thermal insulation retention, permeability to air, and moisture transpiration rates, the water absorption and wicking characteristics and drying rate characteristics were also studied before the following conclusions were drawn.

The authors concluded that a bulked nylon fabric tends to approach the general physical characteristics of cotton and wool staple knit fabrics as far as thickness, weight, opacity, density, packing factor, surface characteristics, thermal conductivity, softness, resilience, air permeability, water absorption and drying time are concerned. It resembles filament nylon fabric in moisture regain and wicking properties, and all the fabrics with respect to transmission of water vapour and drying rate (except wool, which has a lower drying rate).

Probably the main point of the paper was that the comfort of a garment under any selected environmental condition is much more dependent on the state of fiber aggregation in the yarns and yarns in the fabric, and much less dependent on the intrinsic nature of the fiber per se. Some investigators contend, it was said, that the hydrophilic or hydrophobic nature of the fiber is almost insignificant. Other researchers contend that moisture absorption characteristics of the fibers per se have a definite influence on comfort. No matter which contention is correct, the principle of bulking either hydrophilic or hydrophobic yarns to produce more comfortable textile clothing is sound, as evidenced by a constantly expanding market.

False-twist Yarns—Relationship Between Yarn and Fabric Properties—This comparatively short paper was presented by L. Cotton and M. G. Bladon, Courtaulds Ltd.

In introducing the paper the authors mentioned how false-twist yarns have moved into the knitted outerwear field over the past three years. Their move into this and other fields has resulted in the development of modified versions of the yarns. The purpose of the paper was to consider the nature of these modifications and to what extent they are necessary.

Courtaulds' own false twist yarn, Courtolon, was used in the experiments.

The various characteristics of a false twist yarn were discussed, as were the different basic methods of producing a modified false twist yarn. It was explained that five Courtolon yarns, all produced from 2/70 denier nylon 66, were chosen as given a broad selection of modified yarns.

After discussing yarn properties in comparison with fabric properties, additional yarn characteristics and finishing treatments, the authors dealt with the choice of yarn for knitted fabrics.

They said that when considered with the wide range of machinery for knitting available it becomes very hard to make clear-cut recommendations for the type of yarn to be used. Three main factors have to be taken into consideration in choosing a yarn for a given purpose: the finished width of the fabric; the degree of stretch in the fabric; and surface texture and handle of the fabric.

Width will increase as crimp rigidity decreases, but differences between types are much influenced by the type of knitting machine, knitting construction, and knitting stiffness. In only a small number of instances had a yarn of low crimp rigidity been essential to give required width.

The degree of stretch is a determining factor in several clearly defined applications. At one end of the scale an unmodified yarn will generally be used for circular knit swimwear fabrics to get the needed stretch;

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but high stretch is not wanted in bulky knit fabrics produced on coarse gauge circular or flat machines and a yarn with a 10 per cent crimp rigidity can be used. In such applications as the latter, plucking and snagging risks must be cut, and to do this a higher denier filament than normal is needed. So such yarns as 205 denier, 6 denier per filament, and 70 denier, 3.5 denier per filament (nylon 6.6) are useful in multi-folds.

Low Stretch Desirable

Similarly a low stretch yarn is desirable in dress fabrics produced on 14 to 20 gauge circular machines, where fabric rigidity is required. A yarn of higher denier filament is also useful, not to prevent snagging but to give improved handle. A 70/20 denier nylon 6 would be successful here.

20% Rigidity Most Useful

There is a wide and important field of outerwear fabrics produced on seven to 12-gauge circular and power flat and 21 to 27-gauge f.f. machines where handle and texture are factors of yarn choice. All five yarns used in the experiments could be used to give varying handles and textures, but most throwsters or knitters would not have such a wide choice available. To sum up, therefore, a yarn of about 20 per cent crimp rigidity would be the most universally useful. It gives compromise in firmness and flexibility of fabric handle. There is then still room for an unmodified yarn of comparatively high crimp and one of the modified type with low rigidity. It must be said, declared the authors, that unmodified yarns find application mainly because of commercial considerations. Yarn of very low crimp rigidity is used where fabric width has to be considered and where emphasis is placed on fabric flexibility and maximum freedom from wale widening.

Other Papers

Other papers at the conference were concerned with the manufacturing and processing of bulked yarns in Czechoslovakia, modified viscose fibers, bulked yarns in woven structures, and the engineering scene in the field of bulked yarns.

Linen Combined With Synthetics

LONDON, England — Scientific research is leading to new uses for linen. This traditional textile is now being successfully blended with man-made fibers to produce new fabrics with all the inherent qualities of both basic products. A number of these fabrics, which have been developed by Courtaulds and the British Linen Industry Research Association, have just been shown at a four-day exhibition at the Research Institute, Lambeg, Lisburn, Northern Ireland.

Irish linen has many fine qualities — it is strong and inextensible, it can absorb moisture much more rapidly and effectively than any other textile, it is cool, has an attractive appearance, and its prestige stands high throughout the world. To these qualities now are added the distinctive features of some of the man-made fibers — ease of washing, crease resistance, durable pleating and lightness and warmth of handle.

Research carried out by the Linen Industry Research Association has developed techniques for combining linen and man-made fibers to produce these new fabrics with the advantages of both basic materials. It has also taken account of the fact that both linen and made-made fibers have one thing in common—long fibers. The linen industry alone of the traditional textile industries has the machinery, the experience, and the skill for dealing with long fine fibers, and these advantages can now be turned to good account in the intelligent use of man-made fibers.

New Range

Tricel and Courtelle, the two man-made fibers featured in this exhibition offer a whole new range of garments, from evening dresses to swim suits all in long staple fibers.

In all, over 50 examples of fiber made from blends of Tricel, Courtelle and flax were on view.

The Research Association is investigating many aspects of blends of man-made fibers with linen. One example is the development of bleached flax.

Warp Knitting

Procedures For Analyzing Raschel Fabrics—Part 4

By H. ROTENSTEIN

THERE are several factors to be taken into consideration when studying a sample for the purpose of determining the gauge of the machine it was knitted on. A wale count is the first obvious step, since each wale represents one needle of the machine. However, it should be used only as a starting point upon which further calculations will have to be made in order to arrive at a final conclusive result.

From the moment the yarn is converted into a fabric until it reaches the customer, and even after that, a knitted fabric undergoes several stages of shrinkage. The amount of shrinkage, whether widthwise or lengthwise, will depend largely upon the following factors:

(a) Type of knitted structure and counts of yarn.
(b) Type of yarns used.
(c) Dyeing and finishing processes.
(d) Usage by the consumer.

Considering the above points we realize that the dimensions of a given sample may vary vastly from those of the original fabric in its greige state. Since it is the latter which can provide us with the best information as to the guage of the machine, we must reverse the procedure and add the suggested shrinkages to the dimensions of a sample in order to arrive at the true gauge. Let us therefore discuss the above points and explain the amount of shrinkage as well as the reasons for it.

(a) The first shrinkage takes place right on the machine, and the width of the fabric on the cloth roller is usually narrower than the actual knitting width at the point of the needles. This contraction depends upon structure of the knitted loop and its tightness.

Assuming we set the take down rollers at a certain rate of pull and slacken the tension on the beam or increase the feed, then the additional yarn fed will tend to make the fabric slacker and wider. By the same token, adding to the count of the yarn will increase the width of the fabric because the additional thickness will tend to push the loops apart.

If we keep the rate of yarn feed constant and increase the take-down, then the length of loop gained will be lost in width and the fabric shrink accordingly; decreasing the take-down will widen the fabric.

Apart from the consideration of stitch tightness, we also have to take in account the stitch construction. It is well known that a tricot stitch of 2-0/2-4 will result in heavy shrinkage, unless a fairly coarse yarn or extremely little take-down is used. On the other hand, a pillar or chain stitch type construction will shrink much less and in many cases will actually keep its dimension. This can be particularly noticed in fillet nets or certain shoe cloth fabrics. In fact, the chain stitch shows opposite characteristics to other types of stitches. The tighter the stitch, the less shrinkage in the cloth, unless the inlay connecting threads are heavily tensioned to pull the pillars together.

The major offenders in the lack of dimensional stability are most open structures and nets. But here the results are opposite, inasmuch as that they are pulled out to anything up to twice their knitting width, depending on gauge of machine. Thus, plain veilings can be knitted on 36gg or 48gg (even 58gg had been attempted), or hair nets on 36gg or 24gg. Still, irrespective of gauges, the finished nets will look alike.

Exceptions to the rule can be found in laces and certain laundry nets. In both a normal tight stitch will give certain stability, while the inlay threads in laces do not allow the cloth to be stretched. On the contrary, lace fabrics shrink somewhat during finishing.

(b) The second factor in the shrinkage of a fabric is the types of yarns contained in it. This shrinkage actually takes place in the first stages of finishing; namely, as soon as the fabric is exposed to steam or any wet treatment. Among the natural yarns, wool shrinks the most and, in very loose structures, may contract very considerably. Synthetic fibers may shrink up to ten per cent, with the exception of the high bulk varieties, Textralized or crimped yarns. For instance, a fabric made of Ban-Lon yarn will shrink during wet processing approximately 25 per cent both in length and width. Helanca will contract greatly on the machine itself, since it is a stretch yarn and knitted usually under tension, and wet treatment will add to the shrinkage. Fabrics constructed of yarns with a high factor of shrinkage can easily deceive one in respect to the gauge of the machine, and allowance must be made in order to arrive at a fairly accurate estimate.

(c) During the finishing processes the dimensions of a fabric can be altered quite drastically, and with the advent of the thermoplastic fibers this change can become permanent.

During piece dyeing the goods remain usually in a relaxed state and the shrinkage taking place at this stage is that of yarn shrinkage, as previously described, and in addition there is what is known as relaxation shrinkage.

By that latter we understand a re-orientation of loop structure into a somewhat more even and natural state, after it had been under various strains on the machine during the knitting process. However, the relaxation shrinkage amounts to only little and need not throw us off our gauge estimate to any large degree.

After wet finishing the cloth, whether in pieces or in the shape of a garment, will undergo some further treatment, which may assume the form of pressing, steaming, calendering, etc., in order to enhance its appearance and give it some dimensional stability, temporary as it may be, or heat setting for permanent shape.

In the first one, usually little attempt is made to stretch the cloth much beyond its natural dimension because it will not hold long, and we are therefore not concerned with this factor.

More serious consideration must be given to fabrics which have been heat set. Items such as veilings or shoecloth may be stretched far beyond their original knitting widths and stabilized in this state. Of course, these yarns must be of thermoplastic character. A sample of this type may defy determination of gauge.

(d) The last change in dimension of a cloth takes place during the actual use by the wearer, and many a sample is obtained from such a garment.

Repeated washing will tend to shrink the fabrics to varying degrees, the main offender being wool, which has the additional tendency to felt. Heat set fabrics should keep their dimensions during the normal life of a garment and, in fact, may be stretched out of shape. Cotton fabric will shrink a little and then stay firm, unless stretched out of shape by the wearer.

From the above points it should be clear that a minimum knowledge of fabric shrinkage and yarn reaction to finishing is needed in order to arrive at a fair estimate of machine gauges. Even then one cannot always tell to what degree a fabric has been stretched or worn, and in this case experience and knowledge of the industry must do the rest.

The following pointers should therefore be helpful for a rough estimate of machine gauges and give a basis upon which to pursue the subject:

- All-over laces and gauge bands are at the present time exclusively produced on 36 gauge machines. Some narrow bands could be made on 48 gauge.
- Laundry nets are made on 36 gauge, some on 24 gauge units.
- Veilings and hair nets can be made on any gauge with the same result, but normally on a 36 gauge, unless 48 gauge and over is available.
- Power nets are knitted on 36 gauge machines, with the finer fabrics made on 48 gauge units. With some experience

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one can usually tell the difference between the two.

• Outerwear fabrics come of coarser gauges, ranging from 12 to 24 gauge. Men's cotton or wool T-shirts come off 18 and 24 gauge machines, while ladies' stoles, jackets (usually wool or Orlon) need an 18 gauge machine.

• The average shoe cloth is of 24 gauge, with the finer variety utilizing a 36 gauge machine. The difference between the two can be told by the finer stitch construction and finer yarns.

The recently developed Raschel carpet industry uses specially constructed machines, usually of 12 or 10 gauge.

From the above described stages of fabric contraction we can now realize the difficulty in estimating correct machine gauges, particularly because of the arbitrary dimension to which a cloth can be set in order to satisfy demands for specified yields. However, if by experience and knowledge the shrinkage of a sample can be appraised, then the whole process of gauge calculation can be narrowed down to a simple formula.

Assuming we counted the wales in a sample and arrived at 32 wales per inch, estimated shrinkage is 25 per cent. It follows that the 32 wales occupy only 75 per cent of the original knitting width. But 75 per cent of 32 is 24, and therefore the gauge is 24. To put it down in a formula:

$$\text{Gauge} = \frac{(100 - \text{Per cent shrinkage}) \times \text{Wales per inch}}{100}$$

where W.P.I. = Wales per inch.

NUMBER OF NEEDLE BARS— Since a Raschel machine can be equipped with either one or two needle bars, we must include this point in our description of the machine. A visual inspection of both sides of the sample will tell the story almost immediately.

A one-needle bar fabric shows on its front the overlaps which show up as loops, whereas the back reveals the underlaps. In the case of two-needle fabric both its sides show overlaps or loops with the underlaps hidden inside the knitted structure. However, the two faces of a two-needle bar fabric are not necessarily identical in appearance.

A cloth knitted with the aid of one guide bar and a lapping motion of 2-0/2-4/4-6/4-2 will exhibit straight loops on one side whereas those of the other side are alternatively inclined. Some fancy fabrics utilize a needle set-out, revealing both loops and underlaps on one or both sides. However, irrespective of number, shapes or directions of the loops, as long as even a single one can be discerned on each side of the fabric, the indication is to two-needle bars.

It should be pointed out that the use of two needle bars is restricted to outerwear fabrics, trims, waffle cloth, certain net materials and special fabric. No lace machines or high speed machines for power nets and veilings can be equipped with two needle bars.

NUMBER OF GUIDE BARS — If a given sample is of relatively simple construction, the number of guide bars needed for reproduction can be found by visual inspection. At times some additional unraveling will assist in coming to a solution, whereas in the most difficult cases a complete analysis of the structure of the cloth is necessary.

The following paragraphs are intended to outline some outstanding and obvious features of known Raschel constructions in order to facilitate quick determinations of the number of guide bars involved in their construction.

Let us start with all-over Raschel laces. Invariably, the ground net of the lace will be of a 2-0/0-2/2-0/2-4/4-2/2-4 construction with an additional inlay bar reinforcing the net. The result is the hexagonal hole net, which can be easily recognized as such. In addition to the two ground bars we need a certain number of design bars in order to create the pattern of the lace. To count the number of these bars, we lay a pencil or ruler across one horizontal line of holes of the net and count the different design threads within one repeat in width. Hence, number of design threads plus two (for the ground bars) will give us the total number of guide bars needed for the particular sample.

This rule applies to all present-day laces except those few

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where an additional ground bar is utilized to add interest to the ground net.

Somewhat different conditions exist in lace bands where at least two additional guide bars are employed, one for a pillar to serve as a draw thread and edging, the other for the picot. Thus, four guide bars plus the design bars are the sum total to be noted down.

There are quite a few variations of lace bands. For a weaver's edge we need one additional bar, whereas in other cases two picot bars are used to produce double-edged laces.

A cheaper variety of mostly narrow trims shows a diamond-like ground net, which is usually of a 2-0/2-4 single guide bar construction. However, a second guide bar has to be taken into account for a connecting thread between drawthread and body of the trim. Thus again we should consider four basic guide bars in addition to design bars.

Nettings of various types play an important part in the industry. As a rule they are constructed by the aid of two guide bars. In this category we find all veilings of the hexagonal and diamond shape types, as well as laundry bagging and underwear fabrics.

Fillet type net with square holes need one guide bar for the pillar and one or more bars for the connecting inlay threads. If the net shows the undesirable feature of sliding pillars, then it can be assumed that only one guide bar has been used for the sidewise connection. Good stability of the net points to the use of two inlay guide bars.

Hair nets are usually made with the aid of four guide bars: two for the net itself, one for the selvedge thread and the fourth one for the elastic threads.

Plain power nets, which constitute 95 per cent of this field, are knitted on four guide bars, two bars for the net and two for the rubber threads.

The previously described fabrics are of plain standard construction, and with some experience there should be no difficulties in establishing the number of guide bars.

The matter becomes more involved in the case of outerwear fabrics, shoe cloth and other fancy fabrics. Plain outerwear fabrics are very seldom encountered for the simple reason that they are manufactured more economically on flat or circular machines.

It is quite impossible to lay down a definite rule covering a particular category of Raschel fabrics (except the ones mentioned before), because even within a narrow range of fabrics there are so many possible variations that in order to determine the number of guide bars we have to wait until the fabric has been completely unraveled or until the lapping motions of the guide bars can be drawn on paper.

We shall therefore complete the discussion of this point and return later when the information about number of guide bars will be supplied almost automatically.

SPECIAL ATTACHMENT—Special attachments to Raschel machines are not very numerous and most of them almost have gone out of use. Still, because the reproduction of a sample will depend upon suitable machinery, this point must be mentioned. Possible attachments to Raschel machines comprise the following: fall plate (also known as chopper bar), chain automat, crepe device, shuttle device (on K-Looms), power feed (for power net production).

Of all the above attachments the fall plate is probably the most widely used and can be found in outerwear producing mills.

Among fabrics produced with the aid of the fall plate are those used for women's stoles, jackets, baby blankets, ruffles, men's T-shirts, trims, shoe cloth and many special items.

It is not the purpose of this article to describe the action of the fall plate, but only to explain how to recognize its use. However, it should be pointed out that guide bars carrying the threads to be acted upon by the fall plate are carried in the front of the assembly. Thus, when these threads are shogged across several needles for a long underlap, they are not tied into the fabric, but float on top up to the point where they are

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lapped around the needles. This floating is in effect the purpose of many fall plate designs, since it allows the creation of fabrics which cannot be imitated on other knitting machines.

A second outstanding and obvious feature of a fall plate fabric is that the design appears on the back of the fabric, making the reverse side the effect side. The round loop at the point of reversal of the fall plate threads are also indicative of a fall plate lap.

The chain automat had gone out of use almost completely and cannot be found on any of the machines built presently in the United States. The Barfuss R-53, built in Germany, can be purchased with an automat, if so desired. The main reason why it is seldom used lies in the greatly reduced speed of operation of the machine it is attached to, and its restricted purpose for major production items such as laces and power nets. In fact, many producers and mechanics do not know of its existence.

At the present time the chain automat is almost exclusively used for the production of scarves with attached fringes and is found in Europe rather than here in this country.

The crepe device has suffered a similar fate to that of the chain automat and for the same reason too: slow speed and restricted use. Its purpose is to inactivate one needle bar while allowing the other one to make several stitches, resulting in bulky or knob effects. Since such a fabric is fundamentally a two-needle structure, it can be recognized by the knitted loops on both faces. Further, one side will show somewhat elongated loops while the other one will show an accumulation of small loops thrown up into a knob or other bulk effect.

The shuttle device is another attachment of the past and can perhaps still be encountered on some old machines. Its purpose is to lay-in a thread across a much larger distance than can be reasonably expected to be done by the aid of a guide bar and its pattern links. Thus, a very long in-lay thread in some specialty fabric will point to the use of a shuttle device or, what is more probable, to the use of a Cidega machine.

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The power feed is not a device to improve or increase the patterning possibilities of a Raschel machine, but rather an aid to control the quality and facilitate the feeding of the rubber yarn in power nets. Its use cannot therefore be deducted from the fabric itself, but it is a foregone conclusion that for the correct production of most types of rubber fabrics this attachment should be available on the machine.

Must Know Number

So far we have dealt with the analysis of a fabric by visual inspection, and many important conclusions can be arrived at in this way. However, in order to reproduce a fabric we must know the number of guide bars involved as well as their lapping motion. The following articles will therefore deal in details with this most important aspect of Raschel analysis.

WildmanJacquardOffers Pattern Card Sealing

NORRISTOWN, Pa. — The Wildman Jacquard Co. of Norristown, Pa., in conjunction with the Ultra-Sonic Seal Co. has developed a new method of sealing or joining Mylar pattern card loops. The sealing of these Mylar pattern cards is now being done by means of ultra-sonic sound waves passing through a 1/32nd wide seam overlap. These sound waves produce a high molecular heat within the Mylar material. By adding a minimum of pressure a homogeneous weld or seam is formed. The Mylar material is not adversely affected in any way, the seam is neat and clean and the bond has proven to be much superior to any other known sealing method. The advantages of the Mylar material for pattern cards have been known and accepted for several years. Now with the added advantage of trouble free seams, Mylar cards, used even under the most severe conditions, have proven to be the most reliable and long wearing.

The Wildman Jacquard Co. is now offering a fast, reliable, low cost sealing service for those customers producing their own Mylar pattern cards. Mylar control card blanks can be supplied with any number of blocks specified.

Mill News

Colfax Industries Now Name for Bonnie Lass

Bonnie Lass Knitting Mills, Inc., has changed its corporate name to Colfax Industries, it was made known by Leon Atkind, president.

Colfax Industries will operate and supervise all manufacturing activties of the full-fashioned knitting plants in Graham, N.C., Asheboro, N.C., Uniontown, Pa., Puerto Rico, as well as the main offices and plant at 320 Colfax Avenue, Clifton, New Jersey.

Colfax Knitwear, Ltd., a subsidiary company specializing in men's Ban-Lon knitted shirts, sells to retail specialty stores, department and chain stores throughout the country.

Sebastian Sportswear Plans $500,000 Expansion

LOS ANGELES, Calif. — Sebastian Sportswear Inc. is planning an expansion that will triple its output.

Ted A. Podbereski & Associates, Philadelphia, has been retained to provide the layout and materials handling system.

Sebastian was found in 1948. A subsidiary in Italy manufactures hand fashioned ladies' sweaters and jackets to order. The plant here makes full fashioned ladies' sweaters, knitted and woven skirts and pants, cut-and-sewn sweaters, jackets and pants and cut-and-sewn coats of circular knit cloth.

The line is sold mainly in the West. A New York City office has been opened to expand sales in the East.

Robert Slayton is president.

Herbert Mills Foundation Announces Scholarships

MARION, S.C. — Garland Smith and David James, both of this city, were recipients of annual scholarship Awards made by Herbert Mills Company, here, through the Herbert Mills Foundation, Inc.

Closing For Vacations

The following firms have announced they will be closed for annual vacations:

Philadelphia Dye Works—July 2-16

Robert Reiner, Inc., Weehawken, N. J.—July 17-31

Wildman Jacquard Co., Norristown, Pa.—July 1-16

Infants' & Children's

New Knit Lines Resemble Adults' In Boston Show

BOSTON, Mass. — With more and more styling going into children's knits, the United Boston Children's Wear fall showing, June 4-8, had all the color and novelty of an adult presentation.

Here, too, jacquard patterning has come back strong and there were some applications of foam laminates. Orlon was the predominant fiber and bulkies were very much in vogue even in the 3 to 6x group. There were also some fancy looking shaggies for juveniles, some made by new processes. New shades have been added to many lines but there were some mixed feelings as to the reception of magenta. There was agreement that it will be a great season for bright greens.

Retailers apparently suffered severely from the very cold spring here but nevertheless, bookings were good and attendance certainly up to par although not exactly of boom proportions. Still, prospects were encouraging.

To shirt and shorts outfits for ages 2-3-4, Wooly Togs Knitwear has added vest effects, reminiscent of the old West, and high-rise vestee type waistbands on the shorts. One such vest is double breasted with two stamped metal buttons on each side. On each side there are also two rows of twisted cord in color wedging from the shoulder to the waist. The cord is tacked on so as to attach the vest to the long sleeved white shirt which has a fashioned collar and the vest pattern is an argyle jacquard pattern that comes in two tones of blue, or spruce and corn silk with white. The shorts are Bedford rib knit and have suspenders fastened with two metal buttons on the boxer waist.

The high-rise vestee waistband is applied to shorts of corduroy in solids of blue, spruce and Burma and the white shirt for this outfit is stitched in a French mesh jacquard and has a button-down collar.

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Cardigans to go with shorts have an all-over Indian madras pattern combining white with blue, spruce and burma. For these, Wooly Togs uses a rounded hem and three button trim, and corduroy, matching the shorts is used for the collar and for piping on the border and hem.

Jacquard is also strong in knit hats and Cinderella Knit Knacks has a variety of applications made up in Orlon. Hy Finkelstein, representing the line, said that high plush and skin fur trims were new for fall and that purple and gold were showing some strength while emerald green was far and away the popular shade, color-wise. Another big knit item in the knit headpiece array was the ribbed toque, a bulky that can be worn in a variety of ways; cuffed, squashed on top or down over the ears.

This firm had cuddle caps of laminated cotton jersey, lined and trimmed with appliques. For boys, Cinderella had laminated knit fedora type hats and hunting and ski caps with jacquard trimming on the ear laps. These came in solids of rust, red, plum and beige.

Brushed Acrilan was the big feature of the Sargon Knitwear line and was offered in muted combinations of orange, burnt brown and rust. Cross tone blending in plaited ratton knit also combined chestnut, blue, olive and gold into heather fabrics and these make up into heatherish looking sweaters with a color pattern. Sargon is repeating the British tab collar, successful last season. This is somewhat like a mock turtle but is fastened with two buttons.

Charles Rubin, representing Sargon here, said that zippers were very much wanted in sweaters for juveniles, boys and young men and one application of this closure was used on a cardigan with a three-way gaucho collar which could be worn as a turtle, open or standup collar.

Sargon shaggies have a mohair look and are made by pulling the hairs out by electricity. They come in pullover styles only and combine orange, blue and lemon, two tones to a sweater. This firm also has pullovers in Scotch rainbow heathers combining blue, gold and brown.

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Each tone predominates in the body and the other two colors are used in a stripe trim on the V-neck, cuffs and hem.

Formerly, Glengyle Knitting Mills knitted sweaters exclusively for a few large accounts but for the past three seasons have been selling some of these styles generally. For fall, Glengyle has twelve new sweater styles which were presented at this show. One of these was a white Orlon bulky with a two inch wide V applique in two contrasting colors extending from the shoulders. This had a low crew and was offered in sizes for 8 to 14 and 3 to 6x.

Al Wolff, representing the line in New England, said that there was much interest in the Swiss jacquards combining red, green, black and white and also turquoise, red, black and copen in horizontal stripes. Glengyle's version is done in a small scale and has a delicate appearance while still carrying out the features of the pronounce a Swiss jacquard as used on bulky ski sweaters. This pattern is offered in a turtle neck pullover and also in a two-button placket style.

Glengyle has also gone in for cotton knit stretch pants for the first time. For the Capris, this manufacturer uses a tapestry pattern working in orange, elf green, gold, white and black. The matching tapestry trim is used on the roll collar and three-button placket of the top of jersey in solid color. The three-quarter sleeves have a turn up rib cuff in a contrasting shade.

This firm has also ventured into laminates which have been used for a cotton jacket lined with corduroy. This is a double breasted garment with slash pockets. The rounded collar and trim on the pockets are also of corduroy matching the lining and the body of the garment has an all-over jacquard pattern of black, red and white. Two simulated wooden buttons are used on either side of the front.

Brownie Laben, New England representative of Huntingdon Mills, said he anticipates a big year for the ski look. If so, he is in a fair way to make the most of it for this firm has a line of Orlon bulkies with pronounced

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applications of jacquard trims in new arrangements.

Commander blue and red are pronounced as the big colors with royal following close behind but Mr. Laben is not enthusiastic about magenta which he says is tapering off already. For green, a tartan shade has been used to give a somewhat muted and unusual tone to the strong, virile jacquard patterns of the boys sweaters.

Huntingdon Mills has used a combination of crew and boat neck for one style and another has a roll collar with a zipper placket and a crew neck is also used on a zippered cardigan. Where a jacquard trim is used, it extends in a yoke about twelve inches deep and for all-over patterns there are Navajo designs and plaids large enough to resemble harlequins. Brownie also said there was good interest in coats and pullovers of brushed Orlon in heather tones.

The influence of German machines was very pronounced in the Youthcraft Knitting Mills line of knits for infants, and the 2 to 4 and 4 to 6x sizes. Fabrics consist of a multitude of stitches combining rick-racking converse and inverse, checks, ribs, waffles and pearling. Colors for this group have been toned down and used in subdued intarsia effects.

Reuben Polansky, representing the line, said that the firm has the biggest line of bulkies this fall that it has ever had and that copen, pale magenta and beige were probably the outstanding shades in this field. Cardigan styles are obviously the most popular for this group and the company stylists appear to favor a rounded collar that comes to a point in front.

Emerald, rosette, pumpkin and baltic blue set the theme for the May Knitting Company line. The accent was on the 4 to 6x and the 7 to 14 group and this firm is concentrating on coordinating skirts with sweaters. The fashion colors are mixed and inter-mixed and the skirts are offered in solids and plaids of these basic shades.

One cardigan in Turbo Orlon in white has a double row of twisted, embossed herringbone striping in Baltic blue and emerald and also in pumpkin and rose. Five large pearl buttons are used down the front.

Men's & Boys'

Midweight Bulky Is Alabama Hit

BIRMINGHAM, Ala. — Knitwear sales were high at the Boys' and Men's Apparel Club Showing, May 28-30. 'Midweight' bulkies are chalking up bigger sales than ever, exhibitors said.

Zippered coats and cardigans, mitred collars, in two-tones, at $15 retail, slant pockets, midweight, in blue, gray, green, brown, scored heavily in retailer response.

Flat knits are back in lamb's wool, with rubber in the shoulders, cloth-lined pockets, extra buttons, in cardigan-knit styling, at $13.95 retail, Sig Friedmann of Robert Bruce said.

V-neck long-sleeve pullovers, blue best, but greens, bronze, also selling readily, came up strong at $10.95 retail. Friedman found his Cortina Orlon cloth pullover in a high-V, bayleaf, camel, stone blue, black and white, much in demand.

Orlon midweight cardigans for boys, 6-12, $6.98 retail, made a big splash at the show, and varsity coats in Orlon, made a blazing comeback in sizes 14 to 20, at $10 retail.

All exhibitors agree that shawl collars are dead. None was shown. Cardigans are assuming a much more important place in the sales picture.

V-necks, crew-necks, pewter green and Nordic blues paced the men's style picture, as seen in sure-fire sales for Jack Mann, MacPerth Sportswear, at $6.97 and $7.95 retail.

Ban-Lon, Orlon, lamb's wool, Shetlands, and fur blends shared the spotlight. However, Bill Wall, Truval Shirts, found his biggest response to knits in Ban-Lon.

Smart, simple styling in knits, without too much detailing, paid off in landslide sales for exhibitors at the show.

Trend To Flat Knits Reported At Show

MIAMI, Fla.—Men's sweaters seem to be getting away from the bulky to the more flat look in solids and patterns, ac-

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cording to reports of the Men's and Boys' Apparel Club of Florida fall and holiday market week held at the Eden Roc in Miami Beach recently.

V and crew necks were in demand, new shades which got a lot of attention were the blues and orange. There was a strong trend to vests and laminates were active.

Patterns and stripes proved to be impulse items in shirts with Indian and Egyptian type patterns receiving considerable attention.

Cashmere and alpaca jackets and sweaters in lamb's wool were popular. The stripe trim appeared to be waning and renewed interest in the classic stripe was noticed.

Cardigans seemed exceptionally good. Italian knits were strong in both men's and boys' V-neck pullovers and six button cardigans in bright colors.

Name Sales Agency

PHILADELPHIA, Pa. — Boger & Crawford, Inc., here, manufacturers and dyers of mercerized cotton yarns, synthetic and synthetic blend yarns, has named Etherington Bros., Inc. as its representative in Pennsylvania, Ohio and New York.

Sewing

Union Special Introduces AutomaticButtonFeeders

CHICAGO, Ill. — Two new button feeders for its Lewis machines have been introduced by Union Special Machine Company. The units — the Speed-Feed automatic button feeder for shank buttons and the Speed-Feed So-Thru for flat buttons — were designed and developed by Rochester Button Company, Rochester, N. Y., and are sold through Union Special for its Lewis button sewers, exclusively.

The shank button feeder handles 16 to 30 ligne self-shank buttons without changes, except a simple gate adjustment. No motor, no drive, no electrical connections, make this economy unit practically maintenance free.

A transparent plastic hopper for sight-checking supply eliminates scratching button surface and reduces noise to a mini-

Swimwear

Alix Of Miami Is Going Public

WASHINGTON, D. C. — Alix of Miami, Inc., well-known Florida manufacturer and designer of women's apparel, has filed a satement with the Securities and Exchange Commission seeking registration of 100,000 shares of Class A common stock. Of the total, 70,000 shares are to be offered for public sale by the company and 30,000 shares by present holders.

The offering will be made at $9 per share through underwriters headed by Clayton Securities Corporation, which will receive a $1 per share commission and $15,000 for expenses. The registration statement filed with the SEC also includes 3,000 outstanding Class B common shares to be sold to the principal underwriter by the selling stockholders at ten cents per share.

The Florida-based company is primarily engaged in the styling, manufacture and sale of women's and misses' swimsuits and beach ensembles, dresses, and misses' sportswear.

The net proceeds from the company's sale of additional stock, estimated at $536,000, will be used to improve the company's working capital position. The proceeds will become part of the general funds and may be applied to any corporate purposes.

Pursuant to a recapitalization in May 1961, the 166.6 common shares then outstanding and owned by Alex Schneidman, president, and Luther V. Powell, vice president, became 30,000 Class A and 116,000 Class B common shares. In June 1961, the company will acquire all the issued and outstanding capital stock of Brookfield Mills, Inc. in exchange for 9,000 Class B shares of the company. Of the 250 outstanding shares of Brookfield, 106.25 shares were held by Tanya Schneidman, wife of Alex Schneidman, and 48.75 shares were held by Mr. Powell, for which 3,825 and 1,755 Class B. Shares respectively will be issued.

The Brookfield stock had a

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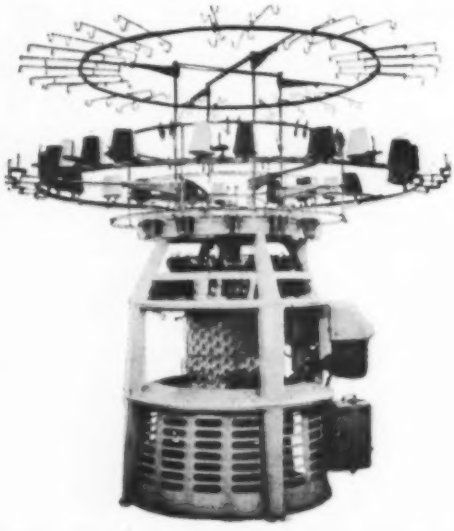

book value of $64,135 at April 1961. Of the 30,000 Class A and 116,000 Class B shares outstanding, Schneidman and Powell own 25,116 and 4,884 Class A shares, respectively, and 94,604 and 20,151 Class B shares, respectively, and each proposes to sell all his Class A holdings.

Philadelphia Stores Promote Swimwear

PHILADELPHIA, Pa.—Local department stores are busily promoting swimwear through handsomely decorated departments and windows, advertising, fashion shows and personal appearances by top name designers. The customers are coming in droves.

John Wanamaker, celebrating its 100th anniversary, has its Seven Seas Shop in its auditorium. It was launched with the appearance of Oleg Cassini, designer of Peter Pan suits.

Lights overhead guide customers from escalators and various points on the floor to the department.

The stage of the auditorium has lush tropical foliage and a bona fide waterfall.

The swim suits are hung on wall racks. In the center of the department is a swimming pool, complete with diving board, and surrounded by palm trees and other greenery. Beach accessories are featured on a counter on the floor.

Gimbel Bros. sets its Gimbels By The Sea department under a sprawling canopy formed by wide ribbons. Swim suits hang along the wall by size and color on double racks. A cart in the front of the department is used to display accessories.

Lit Brothers Sun and Sea Colony has a pool with waterfall in the center of the floor, and swim suits alongside. Manikins lounge around the pool.

Snellenburgs' Sun'N'Fun Shop is cooly modernistic. Fish are suspended delicately from the ceiling. Pencil-thin strips of black cellophane form cabanas as backdrops for manikins on two spots on the floor.

Strawbridge and Clothier's Sea and Sand Shop is in a section of the floor that is walled-in on three sides giving it the appearance of a separate shop dedicated exclusively to swimwear. Fish net is draped over the department sign and walls are decked with nautical props above the swimsuits.

Laminated Knits

Finish Baked On By Polydynamic

(*Continued from Page* 19)

fabric goes up and over into the cure box, where the same minutely regulated controls are in effect.

Inside the cure box, the fabric is looped and hung on rollers and moves through. At peak load, some 450 yards of fabric are in the box.

The finishing range was acquired by Polydynamic along with the plant in its search for a solution to the problems of finishing laminated goods. The former owners used the machinery for processing woven goods. Polydynamic has had to adapt all the machinery, including the range, to the needs of knit goods lamination, which is where the art and the improvising and the hits and misses come in, Mr. Jackson says.

Polydynamic is an independent corporation but is under the same ownership as Allied Polymer. Polydynamic services other laminators besides Allied Polymer.

Its pioneering has been helped along by consultations with Dow-Corning, although Sylmer is not the only water repellent used. Scotchgard, the Minnesota Mining product, is also used, and is highly regarded by Mr. Jackson and his colleagues.

Polydynamic offers manufacturers a full range of services, including lamination. It will inspect the final product and guarantee every inch of it. The plant appears busy. Mr. Jackson showed the visitor a green Acrilan currently being processed for Allen Knitting Mills.

Most of the work is heat laminated. The plant will, of course, handle any kind of lamination, including those with the new adhesives. Mr. Jackson inclines toward a preference for the heat lamination. In his experience, the drapeablity and the hand is better with heat lamination.

Foam is processed in another section of the plant. The stuff arrives at the plant in blocks,

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District Associations

Scenes From Pekoma's 'Perry Koma Show' In Hershey

Marty Orliner togged out in a Como sweater pose of the old maestro himself in Pekoma's Perry Koma show.

Abe Krasnoff (left) and Marty Brustein, in a Flintstones sequence satirizing the Du Pont style show held earlier in the day.

Dr. Ed "Liberace" Shils shows his profile as he ambles over to the piano to render the Pekoma concerto.

Ingram Bergman plays a straight part in Pekoma's "Perry Koma" Show.

Stanton Berger and Billie Meyers, both of M & M Knitting Mills, in a Gay Nineties swim suit number.

Robert Gamberg of Infanta Knitting Mills playing the fiddle a la Jack Benny.

Mrs. Naomi Greenburg and Mrs. Hannah Bergman satirize Du Pont's swimwear models in a humorous sequence.

Fan dancer Mort Gordon wows the audience with his daring number.

Right, Dr. and Mrs. Bertrand W. Hayward, president of Philadelphia College of Textiles and Science, delight the audience singing a knitters' duet.

Stanley Meyers, of M & M Knitting Mills, goes into his Flintstone act.

Harry Rutman, of Crescent Knitting Mills, (below) does a take-off on a Du Pont mannequin pirouetting down the runway in her latest Sayelle creation.

Mrs. Gideon Frankil and Mrs. Marty Orliner in a lively dance scene from the Pennsylvania District's "Perry Koma" Show.

or buns, that look like overstuffed auto seat cushions.

The bun is then placed on a conventional table saw and cut into segments, usually quarters. Next, a hole is bored through the center so that it can be mounted on the rotary cutters.

On the rotary cutter the blade is first shaped into a cylinder by an operator who turns it by hand to nick off the square edges on the ultra-sharp blade.

Then, carefully, to width tolerances of plus or minus one one hundred and twenty-eight of an inch—actually less, according to Mr. Jackson—the cutter shaves off a continuous slice of one thirty-second of an inch and it is rolled up for further processing.

District Associations

NEKOMA Meets At Wentworth

PORTSMOUTH, N. H. — The 15th annual seminar of the New England Knitted Outerwear Manufacturers Association was scheduled to meet this weekend at the Wentworth By-The-Sea, here.

Edward A. Brandwein, administrative secretary, National Knitted Outerwear Association, was due to report on the knitwear and swim-wear promotion program of the Knitted Outerwear Foundation.

Charles Reichman, editor of the KNITTED OUTERWEAR TIMES, was scheduled to discuss "New Developments in Knitting and Finishing Machinery and Knitting Techniques—Some Highlights of the Recent Knitting Arts Exhibition."

The three-day program included the annual meeting; a golf tournament led by Louis C. Stoloff, New Knit Manufacturing Co., Lowell, Mass.; a deep sea fishing outing under Benjamin Greenfield, Old Colony Knitting Mills, Newton Center, Mass., and putting and pitch and putt tournaments.

NKOA Members May Fly Cut-Rate To U. K. Show

The National Knitted Outerwear Association has offered to arrange chartering of a plane to fly members to the International Knitting Machinery Exposition in Manchester, England, October 11-21.

The offer is contingent on sufficient interest among the members. Fares may be as low as $250 depending on the number subscribing.

The Association, now canvassing its membership, has stated that it has no private interest of any kind in the flight plan.

Western District Outing Aug. 18 In Milwaukee

MILWAUKEE, Wisc.—The semi-annual meeting and golf party of the Knitted Outerwear Manufacturers Association Western District will be held August 18 at Ozaukee Country Club here.

H. L. Ashworth, Association business manager, announced that reservation requests will be sent out shortly to the members.

Pauker's 73 Wins Hershey Tourney

HERSHEY, Pa. — Morton Pauker, of Tartan Knitting Mills, won the David Frankil Memorial Trophy for golfing at the 42nd anniversary conference of the Pennsylvania District, Knitted Outerwear Manufacturers Association, here. He shot a 73, the lowest gross.

Low net winner was Martin Orliner, of Bergman Knitting Mills, with a low net of 69 on a handicap. He won the Nathan Neuman Memorial Trophy. Bob Graham won the president's low net cup with a 70 on a three handicap, and Tom Greenwood won the Huggins Cup for low gross with a 72.

Third low gross went to William Wall; 3rd low net went to Robert Wuittner; 4th low gross, Robert Judge, 4th low net, Martin Brustein; 5th low gross, Aaron Maimin 5th low net to Leonard Wexler.

In the nine-hole Hershey Country Club tournament, Art Wexler was winner with a 39. Other winners, in order, Stanley Matzkin, Al Krafstow, B. Kaufman, Robert Gamberg and Stanley Waxman.

Mrs. Stanley Waxman won low gross in the women's 18-hole tournament with an 87; Kathy Leedy was second low gross with a 92; and Mrs. Shirley Shils was third with a 93. Low net was won by Miriam Pauker; 2nd low net, Mrs. Horare Borden; third, Ellen Gamberg. Bess Schwartz placed first in the 9-hole tournament. Mrs. Ben Greber was second and Lenore Rutman was third.

Knitted Yardgoods

Betinsky Line Stresses Texture

The laminated fabric collection of R. Betinsky, Inc. is divided into three categories: basic bulkies, fancies and a fine gauge jersey. Basic bulkies, knitted of 100 per cent cotton and 100 per cent Orlon, come in a variety of half cardigan stitch sizes and are available in solid colors or with stripe, check or jacquard patterning. Fancy bulkies encompass a variety of dimensional and textured surfaces in a very wide selection of solids and color combinations. The fine gauge jersey comes in 100 per cent combed cotton, 100 per cent all worsted long staple wool and a blend of 80 per cent Orlon and 20 per cent wool. The most important of these are the cotton and the Orlon blend. These come in the new high fashion shocking colors, heather tones and multi-color jacquards. The latter are primarily in cotton and are highly intricate designs.

Fancies encompass such a wide variety of types that it is impossible to classify them in more definite terms. Betinsky has a specialty department of off-beat, intricately patterned fabrics in fine, medium and coarse gauges. Both flat and surface textured knits are represented. Some of the surface textures include sharkskin, herringbone, dogbone and crowfoot patterning in solids, two tones and multi-colors.

Also in the off-beat classification are 100 percent cotton solids and two-tone textured fancies knitted with unusual combinations of novelty stitch constructions.

Encompassed within the fancies category are intricate jacquard patterns, intentioned primarily for the ski trade, and Nubella, a brushed, boucle-type rib knitted with a 100 percent wool face and an all cotton back. Nubella is available in a wide range of solid colors.

The importance of laminated and plain knitted pile fabrics is also emphasized at Betinsky. Pile fabrics come in all weights, to be used as linings, trims and outerwear materials as well as thick, rubber backed rugs. They are available in a wide range of solid colors with either a 100 per cent Orlon face or a 100 per cent acrylic fiber face; both of which have an all cotton back.

Another luxurious Orlon pile fabric is a fluffy, long hair, angora-like cloth. In addition to outerwear, this fabric is used for millinery, capes and stoles.

Simulated furs are knitted by Betinsky for use as linings and trims. Made of Orlon is a sherling-type fabric for the lining trade. Simulated Persian lamb is knitted with a blend of wool, rayon and cotton, and only close scrutiny reveals the truth.

THE INDUSTRY'S MARKET PLACE

Advertising rates: $5.50 per column inch per insertion. Positions Wanted: $5.00 per column inch per insertion. Minimum space — 2 inches. Ads for Monday's paper must be in by preceding Wednesday, 2 P.M. Please enclose payment with your order.

MILL EQUIPMENT, MACHINERY—FOR SALE, WANTED

FOR SALE

1—Phila. Jacq. AI, 32", 14 cut, 32 feed
1—Phila. Jacq. AI, 32", 16 cut, 32 feed
2—Phila. Jacq. AI, 32", 16½ cut, 32 feed
1—Phila. Jacq. AI, 32", 17 cut, 32 feed
3—Phila. Jacq. TA-2 30", 11-14 cut, 4 color stripers, all feeds
1—Phila. Jacq., LH-6, 28", 8 cut
1—S&W MFRC, 30", 17 cut
2—Universal Supramat, 63", 4 cut
2—Lamb, 24", 10 cut, border machines
1—Lamb, 24", 5 cut, border machine
1—Lamb, 24", 7 cut, border machine
10—Dubied, Grosser, Roby, 20"-52", 5-12 cut
1—Knit Goods Sewing Plant

Write, Wire, or Phone

SPEIZMAN KNITTING MACHINE CORP.
350 Fifth Ave., New York 1, N.Y. PE 6-0930-1

BEST JK BUYS

See the New Mestre Flat Machine

4—Phila. Jacq. LH Machs., 6 & 7 Cut, 30", 6 Feed
2—Phila. Jacquard LA Machs., 8 & 10 Cut, 30", 12 Feed, 3 color stripers
2—Phila. Jacq. TJ Machs., 7 & 8 Cut, 28", 6 Feed
1—O.G. Interlock Mach., 30", 14 Cut, 12 Feed
2—Phila. Jacq. TJ, 18" 7 Cut, 4 Feed, 4 Col Strip
6—Phila. Jacquard TAI Machs., 12, 13, 13½, 16½ Cut, 30", 12 Feed
4—Phila. Jacquard TA Machs., 10, 11, 12, 13 Cut, 30", 12 Feed
1—Philadelphia Jacquard MLW, 28", 11 Cut, 24 Feed, Wheels and Jacquards
1—O.G. Multi-Feed Jersey, 1x1 Rib, 8 Cut, 36 Feed, 32"
3—Leighton Machs., 22", 26", 28", 10 Cut, 6 Feed
2—Wildman PB2 Machs., 17", 18", 8 Cut
5—Univ. Supr., 4 & 6 cut, 62", new style
2—Universal Supramat, 10 & 12 Cut, 62", like new
2—Queens Model B machs., 60", 10 and 12-cut
1—Dubied BAN Mach., 56", 12 Cut, Jacquards Front & Back
3—Dubied, Single & Double Lock, 22", 7 & 12 Cut, 22", 44", & 47", 4 Bar
3—Cissel Tumbler Dryers
4—Reiner Full Fashion machs., 21 gauge, like new
1—Rimoldi machine
1—Singer Bar tac, like new
2—Stafford & Holt machs., 30", 32", 6 & 7 Cut, 6 & 12 Feed
1—60" Kastrinsky cal. machine
6—Steam Tables and Pressing machs., 30x60, 24x48, 24x60
1—Complete sweater washing unit with six large Cummings-Landau dryers, 1 extractor, and 1 washing double treatment unit
2—8-cut Lamb Border machines

Joseph Kapelowitz, Inc.

APPRAISALS — LIQUIDATIONS — FINANCING

600 Broadway, Brooklyn 6, N. Y. EVergreen 7-1145

FOR SALE

1—Philip interlock machine, 30", 17½ cut, 30 feed
1—Philip interlock machine, 30", 14 cut, 30 feed
2—Ordnance Gauge machines, 30", 12½ cut, 12 feed
4—New flat machines, 63", 4, 5, 7, 10 cut

IDEAL KNITTING MACHINERY CORP.
6 Stanwix Street, Brooklyn 6, N. Y. HYacinth 1-3975

WINDING EQUIPMENT FOR SALE

2—80 spindle Foster Winders equipped with adjustable swifts and waxing attachments.

1—40 spindle Roto Coner—stainless steel rolls, waxing attachments, and slub catcher.

BOX 242

MACHINERY FOR SALE

1—Dubied CAL, 8 cut, Links, 75"
1—Stoll LIFADO, 8 cut, Links, 68"
3—Dubied BARB, 8 cut, V-Bed, 55"
All in excellent running condition

Call or write
M. A. KEFF KNITTING MILLS, INC.
132 Bergen Blvd., Fairview, N. J. WHitney 5-9152

FOR SALE

Six automatic paramold thermosetters.
Warranted excellent condition. For pre-setting Sayelle and other textured fabric, Ban-Lon, etc. $4,200 new.
Make best cash offer.

BOX 260E

FOR SALE

Complete finishing plant in Ridgewood, Brooklyn.

BOX 260R

PRICED FOR IMMEDIATE SALE

4—Lewis Mock Fashioned machines, Model 4-270 (Green), practically new. With or without tables and motors.

CLOVER KNITTING MILLS, INC.
"M" Street and Erie Avenue Philadelphia, Penna.

FOR THE BEST RESULTS USE A MARKET PLACE AD

FOR SALE

1 — 50 lb. paddle dye machine, Monel metal.
Individual motor. Write

BOX 265

YARNS WANTED, FOR SALE

YARNS FOR SALE—REASONABLE PRICES

8600 lbs.—1/5.25 charcoal, heather, 6 denier, Turbo Orlon
2000 lbs.—2/29 charcoal, heather, 3 denier, Turbo Orlon
1100 lbs.—1/5.5, gold, Turbo Orlon
3050 lbs.—1/13, plum, green, Turbo Orlon
350 lbs.—1/5, plum, Turbo Orlon
600 lbs.—1/32's, zephyr, 64's stock, yellow
600 lbs.—1/32's, lt. green
400 lbs.—1/27's, zephyr, 64's, coral
375 lbs.—1/27's, zephyr, 64's, butter ball
3575 lbs.—3 run, 100% garnetted Orlon, jockey, blue, lilac, brown, grey
2000 lbs.—3 run, 75% lamb's wool, 25% Orlon, Brittany blue
250 lbs.—2/34's, charcoal, Turbo Orlon
750 lbs.—1/16, natural, relaxed Orlon
500 lbs.—1/18, natural, relaxed Turbo Orlon
500 lbs.—1/32's, heather, 45% black, 55% natural, regular Orlon

BRITE YARNS CO.
191 Broadway, Brooklyn 11, N. Y. EVergreen 7-1525

WE BUY AND SELL
Worsteds — Synthetics — Blends
AT BEST PRICES!

BEDFORD YARN CO.
MAin 2-1340
Brooklyn, N. Y.
79 Clifton Place

WILSON YARN CORP.

141 Wilson Ave., Brooklyn 37, N. Y. GL 6-9686 H. BERMAN
WE PAY TOP PRICES FOR SURPLUS YARN
We Buy & Sell
WORSTED & SYNTHETIC YARNS
We carry in stock all colors and all sizes for the knitting trade!

Call us if you need short lots of yarn to fill special orders.
We have in stock, at all times, worsted, zephyr & Orlon, in all colors and sizes, on cones, FOR IMMEDIATE DELIVERY
686 Flushing Ave. **CENTURY** Brooklyn 6, N. Y.
Ben Balif **YARN CO.** EVergreen 8-8277
ENTIRE YARN INVENTORIES PURCHASED FOR CASH

FOR SALE
ELASTIC YARN FOR KNITTING
• All Sizes and Colors

BEDFORD YARN CO.
79 Clifton Place
Brooklyn, N. Y.
MAin 2-1340

CONTRACT WORK—CONTRACTORS WANTED

CONTRACT WORK WANTED

Knitting Only

on full automatic flat machines, latest model, 4 cut for men's, ladies' and children's garments. Also trimmings. 500 dozen weekly.

BOX 260D

WE WANT KNITTING

on Links & Links

We are looking to give commission knitting work only on coarse gauge flat or circular Links & Links.

BOX 250W

KNITTING WANTED

on 3-14 cut Philip machines.

BOX 260G

CONTRACT WORK WANTED

making bulky cloth for the laminated trade. 7 gauge and 5 gauge machines. We can also make trimmings, cuffs, bottoms and collars. All on contract basis.

BOX 258

CONTRACTOR WANTED

on men's and boys' Ban-Lon shirts. Will supply immediate work in large quantity.

BOX 250A

CONTRACT WORK WANTED

on 18 cut, double knit, jersey and jacquard cloth. Price extremely reasonable.

BOX 250D

CONTRACTORS WANTED

for double knit dresses and suits, also full-fashioned dresses for quality-minded brand name house.

BOX 260C

BRUSHING WANTED

on one machine. Day and night shifts.

BOX 260H

CONTRACT WORK WANTED

Opening for additional work on 4 cut Universals and 4 cut LH machines. Top quality guaranteed.

BOX 250AA

CONTRACTOR AVAILABLE

Jacquard, 7-cut, Supreme, knitting and, or finishing.

BOX 240T

CONTRACT WORK WANTED

Orlon®, Ban-lon, bulky ladies' and children's sweaters. Finishing only. Workmanship guaranteed.

BOX 262

CONTRACTOR WANTED

for quality infants' Orlon® sweaters on flat Links machines.

BOX 261

CONTRACT WORK WANTED

on Links and Links machines—from 4 to 8 cut; also on Philip and flat machines. Will work with Orlon®, Ban-Lon, Antron and wool for men's and ladies' better grade sweaters.

BOX 260F

CONTRACT KNITTING WANTED

for goods for lamination. Half cardigan stitch from 6 to 10 cut. 60" goods.

BOX 250C

COMMISSION KNITTING WANTED

Have 24 cut, 24" interlock machines available for stretch fabrics.

BOX 260

HELP WANTED

SALESMAN WANTED

By Expanding Yarn Sales Agency

representing prominent spinners of synthetic, worsted and woolen spun yarns. Some technical knowledge desirable. Excellent compensation arrangement.

MEIMAN & CO., INC.
350 5th Avenue, New York 1, N. Y.
OXford 5-5825

KNITTER-MECHANIC WANTED

Experienced on Jacquard LH, TJ, Dubied flats and flat Links. Must be top grade man. Good future, top salary to right man. Must be willing to locate in New England. Write to

BOX 240J

STITCHING ROOM FOREMAN WANTED

Fully experienced on sweaters and swimwear. Excellent position with long-established firm in New England.

BOX 245

KNITTER — MECHANIC AND KNITTERS

wanted for double knit Lebocey circular Jacquard machines.
Mill located in Brooklyn.

BOX 247

PRODUCTION SUPERINTENDENT WANTED

Knitter of men's and children's sweaters, located in Colon, Michigan, requires an experienced Production Superintendent. Must have extensive and well-rounded knitting background, and be able to accept responsibility for complete operation of mill. Reply to

E. J. SAUNDERS
LAMB KNIT-GOODS CO.
32 N. State Street, Chicago 2, Illinois

MECHANIC WANTED

Experienced on LH machines.
Steady. Good pay. Days.

NUSTYLE KNITTING MILLS
112 Lincoln Ave. Bronx 54, N. Y.
CYpress 2-3727

KNITTING MACHINE MECHANIC WANTED

for Phila. TJ, TA, TAI, LH machines, to take full charge of department. Must be production minded. Only top quality person will be considered. Excellent salary and working conditions.

BOX 201

CURRENTLY OPEN ASSISTANT PLANT MANAGER'S POSITION

in cut and sewn line. Background in knitting and finishing necessary. This is an excellent opportunity for a qualified supervisor to be associated with a top quality progressive firm. Send complete resume in first reply.

GARLAND KNITTING MILLS
117 Bickford St., Boston 30, Mass.

KNITTER-MECHANIC WANTED

experienced on Supreme, Scott & Williams, Dubied and Universal machines. Good opportunity.

BOX 260B

KNITTERS WANTED

Experienced on Supreme and Rib machines.
All shifts. Steady. Overtime. Transportation paid.

FALMARK
148-12 94th Ave. Jamaica, L. I. AXtel 1-5670

CURRENTLY OPEN
ASSISTANT PLANT MANAGER'S POSITION

In full fashion line. Background in knitting and finishing necessary. This is an excellent opportunity for a qualified supervisor to be associated with a top quality progressive firm. Send complete resume in first reply.

GARLAND KNITTING MILLS
117 Bickford St., Boston 30, Mass.

KNITTER-MECHANIC WANTED

for flat V-bed knitting plant — also, flat Links & Links machines. Steady, year 'round work. Please advise as to your experience, and salary expected. Mill located in metropolitan area.

BOX 267

INDUSTRIAL ENGINEER WANTED

Challenging opportunity to head department of incentives and methods. Experience in sewing and/or looping of knitted outerwear, preferred. Nationally recognized organization with quality plant in southeastern Pennsylvania. Send complete resume with first letter. All replies confidential.

BOX 259

EXPERIENCED FABRIC MAN WANTED

Thoroughly experienced in all phases of knit goods, to oversee entire mill operation. Excellent opportunity for the right man. Submit complete resume.

BOX 260L

POSITIONS WANTED

YOUNG EXECUTIVE AVAILABLE

Conscientious, personable young executive wishes to transfer to the knit goods industry. Can assist top executives with management responsibilities, sales, production and/or credits. College graduate, gets along well with people.

BOX 255

QUALITY CONTROL and PRODUCTION ENGINEER

with over 3 decades of experience in knitted outerwear—cut-and-sewn and full-fashioned—seeks position with reputable jobber or manufacturer. Experience covers all aspects of production, as well as designing.

BOX 257

PRODUCTION MANAGER AVAILABLE

Thoroughly experienced on double jersey and pique knitted dresses, suits, sweaters, etc. Able to set up complete operation, supervise help.

BOX 260M

CUTTING ROOM SUPERVISOR AVAILABLE

Thoroughly experienced in all phases of women's, men's and boys' knitwear. Also have broad experience in quality control, from knitting to finished garment.

BOX 260N

EXPERT FLAT MECHANIC AVAILABLE

Thoroughly experienced on Dubied, Stoll and all types of flat machines. Will relocate with reliable firm.

BOX 260J

KNITTER-MECHANIC AVAILABLE

Experienced on all types of flat machines.
Call between 8-10 A.M. or evenings:

EXeter 2-3296

COLOR DESIGNER
KNITTER-MECHANIC AVAILABLE

Presently employed by one of the nation's leading mills designing, coloring and setting sinker-top circular machines. Willing to relocate with right firm.

BOX 263

PLANT MANAGER
PRODUCTION COORDINATOR AVAILABLE

Ladies', men's and boys' sweaters. Can take complete charge. Formerly in own business.

BOX 264

BUSINESS OPPORTUNITIES

TOP NOTCH MECHANIC SEEKS EXPERIENCED PRODUCTION MAN

with substantial capital to invest in large, well established top grade knitting mill.

BOX 269

REPRESENTATIVES, LINES WANTED

"MEDIUM TO BETTER" BLOUSE MANUFACTURER

— Paris, France —

SEEKING MANUFACTURER REPRESENTATIVE

National sales distribution for entire line. Large following among leading department stores and better ladies' specialty shops in the U. S. A. Annual volume could be $1 million.

BOX 256

WANTED

Bulky knit sweaters to sell jobbers, western states—or retail stores, Southern California.

BOX 240H

SERVICES, SUPPLIES, FOR SALE

SAM STARK *specializing in*
CREATIVE JACQUARD DESIGNS
60 Clarkson Ave., Brooklyn 26, N. Y. IN 9-8554 Aft. 3 P.M.

CLOSE-OUTS WANTED

CLOSE-OUTS WANTED
CASH PAID for surplus stocks of Sweaters and Bathing Suits.
BERNETTE TEXTILE COMPANY
101 W. 31 St., New York City BRyant 9-5526-7

STRETCH NYLON CLOSEOUT
600 lbs. 70/2 conventional stretch nylon, natural full cones, original cases.
500 lbs. 70/2 nylon stretch Saaba, natural, full cones, original cases.
REASONABLY PRICED. SPOT DELIVERY
BAY YARN CO.
P.O. Box 627 Mt. Vernon, N.Y.

JERSEY FABRICS, CLOSEOUTS WANTED
Cotton, Orlon, Acrilan, solids & fancies. Fleeces, Metallics.
Knitted collars, woven piece goods & remnants. *We pay cash.*
CHARMKNIT CORP.
82 Franklin St., New York City WAlker 5-6828

$$ CASH PAID FOR CLOSEOUTS $$
SWEATERS — POLO SHIRTS — SPORTSWEAR
Men's, Boys' Girls', Ladies' CALL US FIRST!
ARNA KNITWEAR, INC.
1265 B'way, N. Y. 1, N. Y. OR 9-1677

MERCHANDISE FOR SALE

INFANTS' and CHILDREN'S COTTON KNITS
of high quality, wanted by leading sweater house.
BOX 260A

YOU'LL GET BEST RESULTS AND FAST ACTION WITH A "MARKET PLACE" ADVERTISEMENT

TRADE WANTS

RATES: one insertion—35 cents per word. Words set completely in capitals — 40 cents per word. Box numbers count as two words. Minimum cost of advertisement—$5.50. Minimum cost of Positions Wanted advertisements — $5.00. Trade Wants for Monday's paper must be in by preceding Wednesday, 2 P.M. Please enclose payment with your order.

Additional work wanted. Bulky sweaters. 4 cut Universals. Knitting only or knitting and finishing. Box 260K

For sale. 7 gauge Dubied machines, double lock, high and low, 40", flat power. Box 260T

Wanted: 3200 yards cotton ratine natural. Submit sample, price, amount putup. Box 266

Established contractor seeks reliable jobber for fine gauge novelty sweaters. Box 260V

For sale: Needles, jacks, parts for 8 and 9 cut Links, Robac, Queens machines. Box 268

Contract work wanted, on ladies' and men's sweaters. Knitting and finishing. Box 262A

Knitter-Mechanic available. Thoroughly experienced Wildman-Jacquard, Box 262B

Quality Control and Production Manager available. Thoroughly experienced all phases of production and designing. Will relocate with reliable firm. Box 262C

Experienced mender wanted. Box 262D

Knitter-Mechanic with experience on Scott & Williams wishes to change position. Will relocate in Eastern United States. Box 262E

To Place Your Ad: Call Murray Hill 3-7519 or Use This Handy Order Blank

KNITTED OUTERWEAR TIMES
386 Park Avenue South, New York 16, N.Y.
Gentlemen:
Insert the ad written below in .....issues.
(*Check one*)

☐ TRADE WANTS
Rates per insertion: 35c per word; 40c if set in capitals. Box number counts as 2 words. Minimum cost per adv. — $5.50.
Positions wanted — $5.00.

DISPLAY AD
☐ 2" — $11.00
☐ 4" — $22.00
☐ 10" — $55.00

Please Enclose Payment With Order.
ADVERTISEMENT

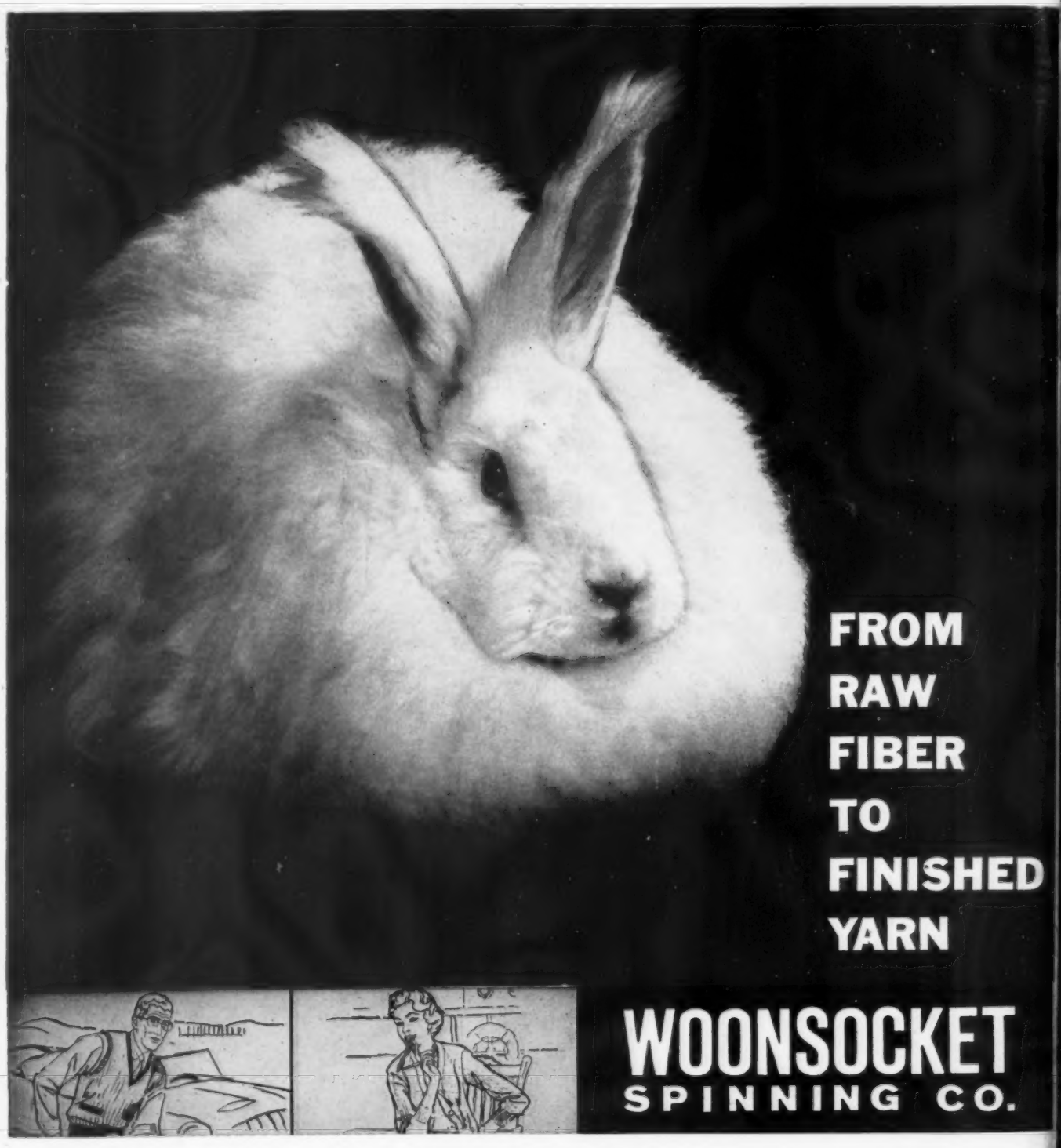
☐ Check here if you want a confidential box number (replies sent to you as we receive them).

Name.....

Address.....

.....

(Use separate sheet if necessary. Attach this order blank.)



When you buy from Woonsocket you are buying the best! Whether it be cashmere, camels hair, angora, fur blends, mohair, lambs wool or other specialty yarn, Woonsocket begins with the world's finest fibers. Woonsocket processes them in its own mills, under highly scientific control until the yarn is delivered promptly to your factory. Thus you are assured of an adaptable resource, able to meet the constantly changing demands of men's and women's fashions.

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